

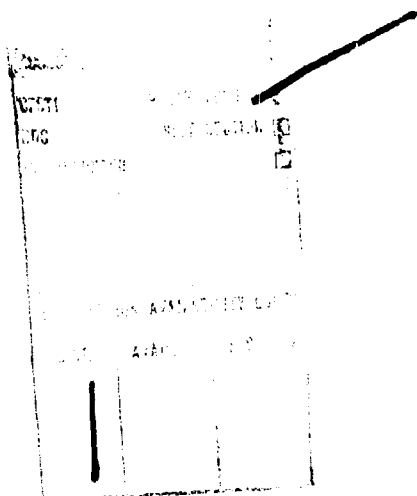
**Abstracts of Personnel Research Reports:  
VIII. 1954-1968**

**AD695483**

Compiled by  
Esther Barlow

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PERSONNEL RESEARCH DIVISION  
AIR FORCE HUMAN RESOURCES LABORATORY  
AIR FORCE SYSTEMS COMMAND  
Lackland Air Force Base, Texas



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## FOREWORD

This volume abstracts the technical reports issued by Personnel Research Division and its antecedent organizations from 1954 through 1968. The reports cover research carried out under Projects 6755, 7717, 7719, and 7734.

Previous volumes in this series are:

- Abstracts of Personnel Research Reports: I. 1954-1957 (PRL-TDR-62-25)
- Abstracts of Personnel Research Reports: II. 1958-1961 (PRL-TDR-62-26)
- Abstracts of Personnel Research Reports: III. 1962 (PRL-TDR-62-27)
- Abstracts of Personnel Research Reports: IV. 1963 (PRL-TDR-63-22)
- Abstracts of Personnel Research Reports: V. 1964 (PRL-TR-64-31)
- Abstracts of Personnel Research Reports: VI. 1954-1965 (PRL-TR-65-23)
- Abstracts of Personnel Research Reports: VII. 1966 (PRL-TR-66-20)

This report has been reviewed and is approved.

F.L. McLanathan, LtCol, USAF  
Chief, Personnel Research Division



### **ABSTRACT**

This volume includes abstracts of the 444 technical reports issued by the Personnel Research Division and its antecedent organizations from January 1954 through December 1968. They cover studies in selection, classification, and utilization of Air Force personnel; systematizing information flow in support of personnel planning; methods of describing, evaluating, and structuring Air Force jobs; and development of procedures for improving the quality of Air Force personnel.

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**ABSTRACTS OF PERSONNEL RESEARCH DIVISION REPORTS:  
VIII. 1954-1968**

**INTRODUCTION**

Under various names and organizational affiliations, the Air Force unit now called the Personnel Research Division has had a continuing central mission of developing procedures for the selection, classification, and utilization of Air Force personnel. Its reports have been published among the series of the several organizations to which the division has been attached: Human Resources Research Center, Air Training Command (1949-1953); Air Force Personnel and Training Research Center, Air Research and Development Command (1954-1957); Wright Air Development Center, Air Research and Development Command (1958-1959); Wright Air Development Division, Air Research and Development Command (1960-1961); Aeronautical Systems Division, Air Force Systems Command (1961); Aerospace Medical Division, Air Force Systems Command (1962-June, 1968); Air Force Human Resources Laboratory, Air Force Systems Command (July, 1968).

This is the eighth volume in a series compiling abstracts of the organization's research reports. It covers 444 technical reports published from 1954 through 1968.

The abstracts appear in order of the organizational series numbers. Entries following the author and title heading of the abstract give information identifying the report and indicate where it is available:

Publication date, month, and year or

Journal reference for papers originally appearing in a technical journal

Series number, e.g., PRL-TR-62-C. The TN series are *Technical Notes*; the TR series are *Technical Reports*.

ASTIA Document number or DDC Document number indicates availability to government offices and contractors from the Defense Documentation Center; this number should be used when requesting reports from DDC.

Project and Task number: Research areas identified by these numbers are given in the Project-Task index. The Air Force contract number and the name of the contracting organization are entered for contract-produced reports.

OTS or CFSTI appears only if the report has been deposited with the Clearinghouse for Federal Scientific and Technical Information, U.S. Department of Commerce, for sale to the general public.

Five indexes are provided: a personal author index; a corporate author index, which identifies reports produced under Air Force contracts monitored by the organization; a project and task index, arranged in project number order; a keyword index; and a cross-referenced subject index. Reports are identified in the indexes by the serial number appearing in the left margin of the abstract entries.

**AIR FORCE PERSONNEL AND TRAINING RESEARCH CENTER (AFPTRC) SERIES**  
**January 1954 - December 1957**

- 1 Gordon, Mary Agnes. Stability of final school grade. April 1954. (AFPTRC-TR-54-11) (Project 7700, Task 77006). A method is proposed for assessing the stability of academic grades when they are used as the criterion of success in the validation of aptitude tests. It yields a significance ratio rather than a correlation coefficient and indicates whether the regression of the criterion on the predictor score remains stable throughout a series of graduating classes. Applied to 9 graduating classes of Control Tower Operator School, significant differences in level of regression were found, but differences were not sufficiently large to affect interpretation of the test validity.
- 2 Thistlethwaite, D.L., Moltz, H., Kamenetzky, J., et al. Effect of basic training on learning by airmen of different intellectual ability. May 1954. (AFPTRC-TR-54-14) (Project 503-001-0009; Contract AF 33(038)-25726, University of Illinois). Airmen differing in intellectual ability are compared in terms of their information at the beginning of the course and their gains in information during the course. It was found that there were significant increases in the knowledge of airmen in 9 of 11 content areas as a result of basic training. Intelligence correlated positively with initial level of information and some trainees at the outset knew more about what is taught during basic training than others did upon the completion of training.
- 3 Mastropolo, S., Carp, A., Erdmann, R.L., et al. A study of the relative effects of six-week and twelve-week experimental basic training programs on a sample of limited-aptitude airmen: Part I. Basic training analysis. Part II. Six-week follow-up analysis. September 1954. (AFPTRC-TR-54-36) (Project 7705, Task 77111). This report examines the relative effectiveness for limited-aptitude airmen (Project 1000) of experimental basic training programs of 6 and 12 weeks' duration in terms of criteria obtained at the end of training and after 6 weeks of initial duty. The 2 training programs differed primarily in the inclusion of 45 hours of language arts and 45 hours of mathematics in the longer course. The 12-week group showed a small gain in arithmetic skills but none in reading or in language arts test scores. Compared for job proficiency, attitude, and adjustment measures 6 weeks after assignment, no differences appeared. A control group of normal-ability airmen working beside the limited-aptitude airmen was observed to be superior on job performance ratings and achievement test scores, but was somewhat inferior to the limited-aptitude groups on attitude and adjustment variables. For practical purposes the 12-week course was not superior to the 6-week course when applied to limited-aptitude airmen.
- 4 Mastropolo, S., Carp, A., & Erdmann, R.L. A study of the relative effects of six-week and twelve-week experimental basic training programs on a sample of limited-aptitude airmen: Part III. Eight-month follow-up comparisons. September 1954. (AFPTRC-TR-54-37) (Project 7705, Task 77111). This second report of Project 1000 examines the relative effectiveness of 2 experimental basic training programs of 6 and 12 weeks' duration for a sample of limited-aptitude airmen. It compares their performance on the job 8 months after assignment. In general, the findings of the follow-up study are consistent with the first study in showing that the 2 training programs produce equivalent results. Though the control group of airmen working beside the limited-aptitude airmen were of marginal ability (Category IV), the controls had significantly higher aptitude and achievement test scores, were rated higher by supervisors for job proficiency, were declared more retainable, and were less prone to absent themselves from duty for reasons of sick call or hospitalization. The Project 1000 airmen conformed less well to Air Force standards in terms of delinquency reports, AWOI, courts-martial, but the majority did manage to stay out of trouble and were declared retainable by supervisors. Extending their basic training did not improve the situation, within the limits of the experiment.

- 5 McQuitty, L.L., Wrigley, C., & Gaier, E.L. An approach to isolating dimensions of job success. October 1954. (AFPTRC-TR-54-49) (Project 7700, Task 77016; Contract AF 33(038)25726, University of Illinois). A study aimed at better identification of factors underlying job proficiency is reported. Descriptions of "best" and "poorest" airplane and engine mechanics were obtained from their supervisors, and a compendium of these descriptions suggests that there are many rather independent dimensions of behavior involved, and that the supervisors emphasized attitudes more than job knowledge when describing men who differ widely in proficiency.
- 6 Mays, R.J. Relationships between length of acquaintance and nature of trait rated and agreement between raters. November 1954. (AFPTRC-TR-54-55) (Project 503-001-0007). Each member of 4 OCS classes rated himself and every other man in his flight on each of 35 personality traits. One class performed the ratings after 3 weeks of acquaintance, a second after 2 1/2 months, a third after 5 months, and a fourth 5 months following graduation. Analysis indicated that reliable peer ratings are obtainable from members of OCS classes after 3 weeks of acquaintanceship and that a 5-month separation does not lower the reliability. Although descriptive traits are more reliably rated than interpretive traits, there is no difference in reliability between emotional and nonemotional traits or between traits involving social interaction and those which do not.
- 7 French, Elizabeth G. A method of content analysis for use with "word pictures." November 1954. (AFPTRC-TR-54-56) (Project 7704, Task 77093). This study describes a method of quantifying relatively unstructured qualitative evaluations. At the time, such qualitative evaluations were in use in the USAF Officer Candidate School and those of Class 51-D formed the basis of the study. Since that time these evaluations have been discontinued but the method described can be used for quantifying such material obtained in other situations.
- 8 Creager, J.A. & Dettler, H.M. The relation between seat location and performance on two radio code tests using loudspeaker administration. November 1954. (AFPTRC-TR-54-64) (Project 7700, Task 77014). The concern of this report is the standardization of conditions necessary in the administration of 2 aural radio code tests, the Signal Corps Code Aptitude Test (SCCAT), and the Army Radio Code Test (ARC-1), given in a room of 107 seats and 2 loudspeakers. Data from 2507 basic airmen who took SCCAT and 2314 basic airmen who took ARC-1 revealed that the average performance of men in some seat locations was significantly superior to that of men in other locations. By taking seat-location effects into account, it was found that the validity would be increased only slightly for the SCCAT and not at all for the ARC-1. Seat locations may have negligible influence in the overall task of selection and classification, even though certain locations are demonstrably superior to others.
- 9 Creager, J.A. Comparative validation of two radio code tests when used with the Airman Classification Battery in selecting radio operator trainees. November 1954. (AFPTRC-TR-54-65) (Project 7700, Task 77014). The Signal Corps Code Aptitude Test (SCCAT), requiring the examinee to discriminate pairs of signals and the Army Radio Code Test (ARC-1), testing his ability to recognize code signals after a brief lapse, are compared for their relative contributions to prediction of success in radio operator training. The findings confirmed earlier studies in showing that the addition of either aural code test to the noncode tests appreciably increased the validity of the selection composite. The difference in validity of the two aural code tests is small when used with the Airman Classification Battery. The higher reliability of the ARC-1 gives it an advantage over the SCCAT for selection purposes. Comparison of various composites of tests in the Airman Classification Battery and aural code tests showed that reliable and valid selection of radio operator trainees may be accomplished by a modified Radio Operator Aptitude Index in which a code aptitude test receives at least half the total weight and verbal and numerical tests the remainder.
- 10 Friedman, F.M. & Ivens, F.C. Factor analysis of the Airman Classification Battery AC-1B, the USES General Aptitude Test Battery, experimental visualization and spatial tests, and psychomotor tests. December 1954. (AFPTRC-TR-54-67) (Project 7700). This factor analysis identifies the common factorial content of the Airman Classification Battery, the U.S. Employment Service General Aptitude Test Battery (USES GATB), the psychomotor tests of the Aircrew Classification

Battery, and Air Force experimental spatial relations tests and paper-and-pencil tests of psychomotor abilities. Using Thurstone's centroid method and the Zimmerman graphical rotations procedures, 9 orthogonal factors were extracted. The Airman Classification Battery has significant loadings on mechanical experience, numerical facility, verbal comprehension, and perceptual speed factors. The experimental psychomotor tests and comparable USES paper-and-pencil tests are good measures of the psychomotor speed factor. The Airman Classification Battery does not reflect the "psychomotor speed" factor, nor the psychomotor coordination and precision factors which are found in the Aircrew Classification Battery and USES psychomotor tests.

- 11 Tucker, J.A., Jr. Use of previous flying experience as a predictor variable. December 1954. (AFPTRC-TR-54-71) (Project 7701). 2 methods of adding previous flying experience to a composite are considered: (a) the wartime method of augmenting the predictor score by an additive constant or a constant multiplier; and (b) assignment of arbitrary score values to flying-experience categories to use directly in the multiple regression process. Each was applied to validation data for 2 pilot training classes in combining the previous-flying-experience variable with selected aircrew classification variables. The multiple regression technique produced higher validity coefficients with less shrinkage in cross validation than the technique of augmenting a predictor score.
- 12 Henry, K.R. & Ward, J.H., Jr. A general-purpose card-programmed control panel for the IBM Type 602-A Calculating Punch. December 1954. (AFPTRC-TR-54-72) (Project 7702, Task 77053). The function of the panel is to program 4 basic arithmetical operations such that A can be operated on by B to give C. The particular operation to be performed is designated by an operation code punched in a card. The elements A and B may be taken from any of 5 storage units or from a card. The result C may be placed in storage or punched in a card. In addition, the panel permits alternate operations to be performed dependent on the results of a balance test.
- 13 Pickrel, E.W. The relative predictive efficiency of three methods of utilizing scores from biographical inventories. December 1954. (AFPTRC-TR-54-73) Project 503-001-0015). Items from the Biographical Inventory of the Airman Classification Battery were selected by 3 methods for prediction of final school grade in Air Force technical schools. 2 of the methods involve grouping items in clusters of high within-cluster correlations, one using a multiple regression technique and the other a unique pattern technique. The third method involves keying items which are related to the criterion whether or not the items form a psychologically and statistically meaningful pattern. In general, the method using the multiple regression technique was most efficient.
- 14 Friedman, G.M. & Detter, H.M. Factor analyses of Airman Classification Battery AC-1A and selected Air Force and civilian tests from the 1949 Normative Survey. December 1954. (AFPTRC-TR-54-75) (Project 7700). This paper compares the common factorial content of the test of the Airman Classification Battery with 4 civilian tests. In 3 analyses 10 factors were obtained of which 7 were common to all analyses and 1 was specific to each analysis. The factors of verbal comprehension, mechanical experience, numerical facility, perceptual speed, and academic information were best defined by the tests of the Airman Classification Battery. The factors of general reasoning and visualization were best defined by Part II and VI of the Guilford-Zimmerman Aptitude Survey, although the Airman Classification Battery had moderate loadings on these factors. The Battery did not have significant loadings on the factors of inductive reasoning, judgment, and fluency of expression.
- 15 McReynolds, Jane. Administration of the Aviation-Cadet Officer-Candidate Qualifying Test under operational versus part-timed conditions. December 1954. (AFPTRC-TR-54-78) (Project 7701). Scores achieved by new airmen with a specific time limit for each section of the test are compared with those of new airmen taking the test under the operational administrative procedure which does not involve the use of specific time limits. The groups, equated on all variables of the Airman Classification Battery, took the test in 2 sessions; the actual testing time for both groups was the same. There were significant differences between groups for 6 of the 13 subtests with all differences in favor of the group given specific time limits.

- 16 Tomlinson, Helen. Development of short alternatives for a valid classification test. December 1954. (AFPTRC-TR-54-80) (Project 7700, Task 7708). Two 4-part chart-reading tests and two 3-part dial-reading tests were studied for the efficiency with which they predicted scores obtained on the Dial and Table Reading test. Predictions from combination of 2 or 3 chart-reading subtests were better than those obtained from the dial-reading tests and were almost as efficient as were all 8 parts of the 2 chart-reading tests. Sets of 2 or 3 chart-reading subtests, requiring 2 minutes of testing time for each subtest are equivalent in predictive power to the Dial and Table Reading test.
- 17 Pickrel, E.W. Prediction of the trainability of "slow learners" from tests with a symbolic and nonsymbolic content. December 1954. (AFPTRC-TR-54-82) (Project 7703, Task 77078). The study tests the assumption that problem-solving tests of general ability in which the material is presented by means of pictures are more effective in predicting the trainability of limited-aptitude airmen than are problem-solving tests in which the material is presented in words. A concrete form and a symbolic form for each of 2 problem-solving tests were administered to 213 limited-aptitude airmen. They then received training in 2 clerical and 2 mechanical tasks and were scored for proficiency on each task. Correlation of test scores with proficiency measures showed the 2 forms equally predictive of trainability of limited-aptitude airmen.
- 18 Anderson, G.V., Fruchter, B., Manuel, H.T., et al. Survey of research on spatial factors. December 1954. (AFPTRC-TR-54-84) (Project 503-002-0001, Contract AF 33(038)-11046, University of Texas). This report outlines the progress of research directed toward description of spatial abilities through factorial analysis of aptitude tests. It reviews the current status of findings and points to problems that require further investigation. Emphasis is on implications for development of personnel selection techniques. From a consideration of the findings of 57 spatial tests, 3 spatial factors are defined: spatial rotation, spatial manipulation, and spatial orientation. A fourth factor is tentatively identified as the kinesthetic factor. Bibliography.
- 19 Ward, J.H., Jr. An application of linear and curvilinear joint functional regression in psychological prediction. December 1954. (AFPTRC-TR-54-86) (Project 503-001-0015). This study concerns methods of combining test scores for predictive purposes when it is known that the scores function jointly. 3 equations assuming various types of joint functional relations are applied to a problem of psychological prediction. The usual multiple regression equation and these 3 are fitted to 436 graduates of a radio operator course to determine regression weights and validities, and then are used to predict course grades for a second sample of graduates. Although the parabolic joint functional equation produced a best fit for the first sample, the equations lost validity on cross validation in proportion to their complexity.
- 20 Taylor, M.V., Jr. & Peterson, R.O. The development of aircrew job element aptitude tests. December 1954. (AFPTRC-TR-54-88) (Project 7701, Task 77025; Contract AF 18(600)15, American Institute for Research). An analysis was designed to improve classification of airmen into aircrew specialties. The first phase was concerned with development of a job-analysis procedure based on the critical incident technique. In the second phase 19 job elements involving attitudes and temperament were isolated. These were reduced to 16 which could be measured by paper-and-pencil tests. This study reports the development of aptitude tests to identify the individuals possessing them.
- 21 Torrance, E.P. The development of a preliminary life experience inventory for the study of fighter interceptor pilot combat effectiveness. December 1954. (AFPTRC-TR-54-89) (Project 7680). A biographical inventory was developed to identify potential fighter pilots. Scores of 31 Korean-experienced jet aces were compared with those of 31 nonaces matched for rank, age, and World War II pilot experience. 12 trait scales and 2 general scales differentiated fighter interceptor pilots from multi-engine pilots and aces from nonaces. Relationships between the Ace Scale and hypothesized characteristics were significant in the expected directions.
- 22 Trevers, R.M.W. An inquiry into the problem of predicting achievement. December 1954. (AFPTRC-TR-54-93) (Project 7703, Task 77070). This paper provides a framework for the development of research on aptitudes and integrates some of the findings of research within this area with outcomes of research in learning and training. Such a framework is needed for studies of



aptitudes to constitute a program rather than a series of separate investigations. The theoretical structure outlined is necessarily very tentative. Its function is to generate a series of hypotheses, each one of which can form the basis of a research project. As such projects are completed, this framework will change to conform with newly established facts and generalizations.

- 23      Neuhous, J.O. & Wrigley, C. The quartimax method: An analytic approach to orthogonal simple structure. December 1954. (AFPTRC-TR-54-105) (Project 7702, Task 77054; Contract AF 33(038)25726, University of Illinois). An analytic procedure is presented for the orthogonal rotation of axes in factor analysis. The aim of rotation is to decrease the complexity of the factorial description of the tests. This results from finding the rotation which maximizes the variance of the squared factor loadings. The method is entirely objective and adapted to machine computation. Numerical examples and computational worksheets are included.
  
- 24      Creager, J.A. Some relations among linear composites, multiple regression, and factor analysis useful in estimating unknown correlations. December 1954. (AFPTRC-TR-54-107) (Project 7702). A technical review is presented of relationships among descriptive statistics of linear composites, multiple regression, and factor analysis. Some of these relations, usually presented for a special case, are generalized and clarified by the use of a uniform notation. The discussion emphasizes estimation of unknown correlations, such as criterion intercorrelations, which are necessary to objective formation of job families.
  
- 25      Berkeley, M.H. A method for developing equivalent forms of tests of complex functions. December 1954. (AFPTRC-TR-54-112) (Project 7704, Task 77094). A proposed method for developing comparable forms of a test composed of heterogeneous items is presented. The technique is a modification of a method for maximizing test saturation. With the proposed technique, two 14-item tests were developed from an Air Force attitude survey. Equivalence was tested on independent samples, and the 2 forms yielded equal means, variances, and covariances with 2 external measures.
  
- 26      Yarnold, J.K. & Berkeley, M.H. An analysis of the Cattell-Luborsky Humor Test into homogeneous scales. December 1954. (AFPTRC-TR-54-114) (Project 503-001-0007). Reactions of individuals to various types of humor might be usable as personality measurements if responses can be classified and scaled. Applying a method of analysis to identify homogeneous items of the Cattell-Luborsky Humor Test, the homogeneous categories prove statistically superior to scales previously derived for these items.
  
- 27      Loevinger, Jane. The attenuation paradox in test theory. Psychol. Bull., 1954, 51, 493-504. December 1954. (AFPTRC-TR-54-121) (Project 7702; Contract AF 18(600)370, Washington University). Classical test theory leads, under certain unusual circumstances, to the paradox that increasing the test's reliability decreases its validity. Literature concerning the "region of paradox" is reviewed. Consequences of these findings for practical problems of test construction are suggested. The same facts which show that pursuit of reliability leads to lower validity under unusual circumstances show that pursuit of "scalability" leads to lower validity under ordinary circumstances. Thus consideration of the "attenuation paradox" leads to a more adverse judgment of "scale analysis" than of reliability theory.
  
- 28      Gordon, Mary Agnes. Tables for predicting success from stanines. December 1954. (AFPTRC-TR-54-124) (Project 7702). These tables are used in constructing expectancy charts to show the expected success of trainees at different aptitude levels. They were developed by assuming successive magnitudes of correlation coefficients between a predictor stanine and course grades. The tables are based upon the assumption of sample occurrences in accordance with the distribution of stanines in the airman population. If career guidance and cut-off scores have been provided for a sample which is to be referred to these tables, a correction formula is required for restriction of range. These tables are useful in overall evaluation of testing programs.

- 9 Flyer, E.S. & Bigbee, L.R. The light plane as a Pre-Primary selection and training device: III. Analysis of selection data. December 1954. (AFPTRC-TR-54-125) (Project 7701, Task 77023). An experimental evaluation of light plane training was undertaken using cadets in pilot training. The purpose was to ascertain whether light plane training provides better data on which to base prediction of success or failure in subsequent flying training. Results indicate that performance data collected during light plane training predicted Primary and Basic flight performance criteria. The Pilot Stanine in combination with light plane measures resulted in more accurate prediction of success during later phases of pilot training than did either type of measure alone.
- 10 Friedmann, G.M., Hempel, W.E., Jr., & Detter, H.M. Comparative factor analyses of three radio operator training criteria. January 1955. (AFPTRC-TN-55-2) (Project 7700, Task 77014). 3 analyses were performed on 3 groups of students who attended the Radio Operator school in the period 1949 to 1952. The criterion of success was a weighted final grade for the first group, pass-fail in the course for the second group, and pass-fail for the code-learning phase of the course for the third group. Since the code-learning phase occupies the first quarter of the course, the analyses yield some information on the composition of the total pass-fail criterion. Besides indicating that half the variance in the code-learning phase is represented by an aural factor, the analyses suggest that the criterion of success in the school changes as the course progresses. Visual and numerical abilities measured by the unaugmented Airmat Classification Battery assume importance in the prediction of final grades.
- 11 Thistlethwaite, D.L., Moltz, H., Kamenetzky, J., et al. Effects of basic training on the attitudes of airmen. June 1955. (AFPTRC-TN-55-3) (Project 7705; Contract AF 33(038)25726, Task F., University of Illinois). Measurements were obtained of the attitudes of over 900 airmen at the beginning and end of the basic training program. In addition, information was obtained on the intelligence, education, experience, and attitudes of the tactical instructor assigned to each of the selected flights. Results indicate an overall improvement in personal adjustment, in favorableness of attitude toward combat and authoritarian leadership, and in motivation to serve. There was an overall decrease in expressed loyalty toward the flight and in regard for the tactical instructor's competence. Characteristics of tactical instructors most highly related to attitude change were the estimated severity of the instructor in enforcing discipline and his attitude toward training objectives. Flights with tactical instructors rated "permissive" tend to exhibit greater increments in motivation to serve than flights having instructors rated "strict." Airmen high in intellectual ability tend to show greater improvement in personal adjustment than airmen of lower intellectual ability.
- 12 Gordon, Mary Agnes. Influence of background factors upon prediction of success in Air Force training schools: A review of the literature. June 1955. (AFPTRC-TN-55-4) (Project 7703, Task 77072). Studies reviewed include: the effects of previous learning experience on subsequent learning behavior; the influence of community characteristics on aptitude scores and on criteria of academic success; the influence of the socioeconomic status of the family and home on predictor and criterion variables; the influence of specific background factors on specific aptitudes and the influence of various background factors on racial differences. Review of the literature chiefly serves to point up the differences in the conditions of public school and Air Force training and the differences which may affect the grades used as criteria. Conflicting answers were found to the question of whether early educational and cultural advantages are associated with better than predicted academic success.
- 13 Smith, R.G., Jr. & Staudohar, F.T. Critical requirements of basic training tactical instructors. June 1955. (AFPTRC-TN-55-5) (Project 7705). The proficiency of the basic training tactical instructor has an important effect on the training of new airmen in military skills and information. This report analyzes 6015 examples of especially effective or especially ineffective behavior of tactical instructors (critical incidents). The examples were reported by basic airmen, tactical instructors, and training supervisors. Effective incidents were reported much more frequently than ineffective in certain areas, such as those dealing with the tactical instructor's use of instructional methods and his use of punishment and rewards. Problem areas identified by a predominance of ineffective incidents are: lack of adequate care in the selection of trainee leaders, inappropriate language, threats, and loss of temper.

- 34 Tomlinson, Helen. Development of short alternatives of factor-reference tests for five primary aptitudes. June 1955. (AFPTRC-TN-55-6) (Project 7703, Task 77082). This report proposes a technique for accumulating information on trait measurement in a form directly applicable in developing new aptitude tests. The full-length, highly reliable factor tests are to be severely shortened and simplified to form an omnibus factor-reference test. A trial of the technique on a small group of reference tests demonstrated that the shortened alternatives are as effective as the full-length tests in identifying a single factor.
- 35 Wheeler, R.E. & Schmid, J., Jr. Synthesis of procedures for the computation of various characteristics of simultaneous equations. June 1955. (AFPTRC-TN-55-9) (Project 7702). This report is a synthesis of various methods for the computation of determinants, multiple correlations, beta coefficients, inverses (or any specific element of an inverse), standard errors of beta coefficients, the elimination of variables from previously computed inverses and sets of beta coefficients, and determinants and inverses for non-symmetrical matrices.
- 36 Gragg, D.B., Kieselbach, D.J., Murphy, W.F., et al. The 14-week exploratory study of marginal-airman basic training: Comparison of proficiency of 8-week and 14-week training groups. June 1955. (AFPTRC-TN-55-10) (Project 7700, Task 77003). The study compares the effectiveness of 2 training programs for low ability airmen which differed only in the length of the training time. The group to receive the experimental 14-week course was matched with that receiving the regular 8-week training on 8 variables. The performance of the 2 groups was measured at the end of their programs by the regular subject-matter tests and by tests administered primarily for this. 2 measures of mathematics showed superiority for the longer training period; on certain other measures a difference in favor of the longer training period was statistically significant but not large enough to have practical importance. There was no significant difference in language arts, even though a major training effort was made in that area. This study showed little gain from an extension of the basic training period for low-level airmen.
- 37 Morsh, J.E., Burgess, G.G., & Smith, P.N. Student achievement as a measure of instructor effectiveness. June 1955. (AFPTRC-TN-55-12) (Project 7950, Task 77243). Effectiveness of instructors was measured by the actual subject-matter achievement of an instructor's students. The Hydraulics Phase of the Aircraft Mechanics Course permitted each instructor to teach 2 classes a month apart, which allowed the gains of his first class to be compared with gains of his second class. On the basis of a pretest and of grades that students achieved in 3 previous phases, the scores students would make on a hydraulics posttest were predicted. An index of instructor effectiveness was determined in terms of whether or not his classes exceeded expectation. Other criteria of instructor effectiveness included forced-choice ratings and rankings by supervisors, rankings by fellow instructors, and student ratings. Results show that student gains can be reliably measured. Students' ratings of their instructors' teaching effectiveness and supervisors' ratings of instructors' verbal facility are correlated significantly with student gains.
- 38 Gordon, Mary Agnes. Implications of regional differences in aptitude for personnel classification. June 1955. (AFPTRC-TN-55-13) (Project 503-001-0001). In this study it was found that white males recruited from the southwestern and southeastern states made better grades in Air Force training schools than those with equal aptitude scores from northeastern states. If differences are attributable to the influence of differences in cultural backgrounds on test scores, then it can be concluded from the data of this study that the observed grade was better than the predicted grade (a) in areas with an initial cultural disadvantage on the aptitude test, (b) in areas where scores on nonverbal tests were relatively better than scores on tests of specific knowledge of mechanical tools. This study suggests that there are variables which have been neglected in predicting success in technical training in Air Force schools.
- 39 Tupes, E.C. & Borg, W.R. Evaluation of a selection composite for screening applicants for USAF Officer Candidate School. July 1955. (AFPTRC-TN-55-15) (Project 7701, Task 77043). Procedures for screening and selecting applicants for USAF Officer Candidate School (OCS) were modified early in 1952. The new composite score consisted of an officer quality score derived from the Aviation Cadet Qualifying Test (ACQT), a score based on board interview, and other scores awarded for years

of college completed, airman technical schools completed, airman rank, and length of service, weighted according to their presumed importance to success in OCS and to later officer performance. Scores on the composite and its components were obtained for OCS Class 53-B. Biserial correlations between these scores and the criterion of graduation did not differ significantly from zero. Only the ACQT officer quality score was significantly related to academic grades. 4 variables were significantly related to military grades (service, rank, and interview positively, and college negatively). Further analysis suggested that modified weighting of the components could improve the prediction of academic grades or of military grades, but that no one set of weights would give an optimal prediction of both criteria.

- 40 Tupes, E.C. Comparison of performance in USAF Officer Candidate School of candidates selected by two screening procedures. July 1955. (AFPTRC-TN-55-16) (Project 7701, Task 77043). Selection procedures for OCS were changed early in 1952, and this report compares results of selection by the revised procedures with selection by those previously used. The existence of a backlog of applicants who had been accepted under the old procedures made it possible to study an OCS class containing reasonably large samples of candidates selected by both methods. The two crucial changes were elimination of college credit requirements and removal of the subjective ratings by past military supervisors. The general effect was to render the bases of officer candidate selection more objective, placing a floor under general aptitude requirements and improving the estimation of past military accomplishments. A greater percentage of the group selected under the new procedures graduated from OCS, and a significantly higher percentage ranked high in the class. Failures for military deficiency were in the same proportion for both groups, but the new selection procedures resulted in higher academic success.
- 41 Cox, J.A., Jr. The development and validation of MDAP English Proficiency Examination Form A. July 1955. (AFPTRC-TN-55-17) (Project 7701, Task 77027). Foreign nationals attend U.S. Air Force Pilot training schools under the Mutual Defense Assistance Program (MDAP). The MDAP English Proficiency Examination is used overseas to select personnel who understand English well enough to profit from this instruction. This report describes the development and the validation of the first form of this test. Form A was administered overseas in 1953 to select personnel to attend USAF pilot training schools. Another sample was tested in the U.S. Analysis of these data gave evidence of acceptable reliability of the test's part scores as well as its discriminating powers. An individually-administered behavior test of English comprehension was developed as a criterion of English proficiency. High correlation of the English Proficiency Examination with the behavior test and with an English test used in Pre-Flight training gave assurance that it actually measures language comprehension. Predictive validity was found for Form A through correlating the test scores with success in Pre-Flight training.
- 42 Tupes, E.C., Bowles, J.W., & Torr, D.V. Predicting motivation for flying training among senior AFROTC cadets. July 1955. (AFPTRC-TN-55-18) (Project 503-002-0007). Students in several universities were given a battery consisting of aptitude, attitude, and biographical information measures, together with AFROTC proficiency measures and confidential statements of intention to apply for later flying training. These expressed intentions were then compared with actual application for flying training. The test battery and the attitude scores were also correlated with registration for flying training. The results of the study indicated that the aptitude tests, biographical information scores, and the AFROTC proficiency measures were not related to application for flight training, but that positive relationships existed between favorableness of military attitude and motivation for flying. A positive relationship existed between stated intention to apply for flying after graduation and actual application. Whether cadets who applied for flying training did so partly because their military attitude was favorable, or whether their military attitude was favorable as a result of their having made up their minds to apply for flying training is unknown.
- 43 Thorndike, R.L. & Hagen, Elizabeth P. Identification of job skills in Air Force recruits. August 1955. (AFPTRC-TN-55-19) (Project 7700, Task 77015, Contract AF 33(616)13474, Teachers College, Columbia University). A printed questionnaire was developed to select potential "By-Passed Specialists" prior to the career-counseling interview. This Experience Record has 150 items covering

- activities relating to 33 Air Force Specialty Codes (AFSCs). The airmen report on a 5-point scale their familiarity with each of the specific job activities involved in the questions. Indications of experience are verified by an Air Force Job Knowledge Test (AFJKT). Data from several administrations of the Experience Record indicate that about a third of the men report experience which justified giving them an AFJKT, and that some 40 per cent of those so identified will "pass" the AFJKT at the minimum level required to qualify for an AFSC.
- 44 Smith, R.G., Jr. & Gragg, D.B. Quality control procedures for monitoring psychological testing. August 1955. (AFPTRC-TN-55-21) (Project 7700, Task 77005; and Project 7701, Task 77032). This report describes simple procedures which will rapidly detect discrepancies in test administration and processing. These procedures are applications to the test-monitoring problem of industrial quality control methods. The use of sequential analysis enables decisions to be made in a more economical fashion than by older more conventional procedures. After the necessary tables have been prepared, the actual monitoring operation involves only a simple clerical routine. The procedures described are applicable to any continuing, large-scale testing program.
- 45 Berkeley, M.H. Comparison of supervisor, co-worker, and self-ratings of WAF job performance. September 1955. (AFPTRC-TN-55-25) (Project 7705, Task 77113). This report describes one phase of a study of attitudes, job satisfaction, and job performance among enlisted WAF personnel. A brief job-rating survey form that includes 8 major areas of job performance was used for self-ratings and for ratings by supervisors and co-workers. Data were gathered at 20 air bases in 7 major commands. One phase of the analysis compared the average ratings assigned by 4 groups: male supervisors, female supervisors, male co-workers, and female co-workers. There were no important differences among these 4 groups in mean ratings they assigned. From the intercorrelations among the 8 items, computed separately for each set of ratings, homogeneous scales were developed. The ratings by supervisors and by co-workers each resulted in a single scale of 7 items, with the same item dropped from both scales.
- 46 Travers, R.M.W., Marston, J.E., & Post, A.J. Some conditions affecting quality, consistency, and predictability of performance in solving complex problems. September 1955. (AFPTRC-TN-55-27) (Project 7703, Task 77071 and 77073). This report deals with differences among Air Force personnel in their ability to solve the complex administrative problems that confront those in positions of leadership. 4 administrative-type problems were developed in which the quality of the solution could be reliably scored. When they were first administered without any attempt to introduce incentives, only small relationships were observed between performance on one problem and performance on another. Consistency and predictability of performance were increased under conditions related to high motivation, but there was evidence that the problems draw upon somewhat different abilities. In an investigation of the consequences of the fact that complex administrative problems do not provide immediate feedback concerning the effectiveness of the solution produced, some evidence was found that the quality of the solution is likely to be in part a function of how long the problem solver persists in seeking improvements in his tentative solution.
- 47 Shanley, D.C. & Smith, R.G., Jr. An evaluation of the language arts aspect of the basic training program. November 1955. (AFPTRC-TN-55-36) (Project 7705). This study is an evaluation of one procedure that was used for the remedial training of airmen who were in Category IV of the Armed Forces Qualification Test (AFQT). This Language Arts Program provided training in reading, writing, and spelling, using military subject matter as a vehicle for the language training. Results indicate that the Language Arts Program was effective in improving the degree of comprehension of written material. Some trainees improved more than others, which suggests the use of low-level training programs as criteria for tests designed to separate those with a mental deficit from those with an educational deficit. The results found here apply only to a group with a fairly wide range of ability. The Category IV designation includes airmen between the 10th and 30th percentile on the AFQT. Other research with a lower level group and with a more extensive literacy program has yielded negative results.

- 48 Moltz, H. & Thistlethwaite, D.L. Attitude modification and anxiety reduction. *J. abnorm. soc. Psychol.*, 1955, 50, 231-237. November 1955. (AFPTRC-TN-55-37) (Project 7705, Task 77115; Contract 33(038)25726, University of Illinois). It was assumed that the process of attitude formation and attitude change, which are of primary concern in indoctrination courses, may overlap considerably with the processes involved in less complex learning tasks. The major hypothesis tested was that communication procedures which successively evoke and reduce anxiety will produce superior learning and increased susceptibility to attitude change. 500 newly inducted airmen in the basic military training course served as subjects in a communications experiment which attempted to modify the attitudes of airmen with respect to proper dental hygiene practices. It was found that greater anxiety reduction was not associated with greater learning, nor was it associated with greater reported conformity to the speaker's recommendations.
- 49 Thistlethwaite, D.L., de Hann, H., & Kamenetzky, J. The effects of "directive" and "nondirective" communication procedures on attitudes. *J. abnorm. soc. Psychol.*, 1955, 51, 107-113. November 1955. (AFPTRC-TN-55-39) (Project 7705, Task 77115; Contract AF 33(038)25726, University of Illinois). The primary purpose of the present research is to discover more effective methods of presenting communications in the basic military indoctrination of airmen. This report describes an experiment on the relative effectiveness of different communication procedures in modifying attitudes. Comprehension of the communicator's intended conclusion was increased when the speaker explicitly stated the conclusion, and when the facts and arguments were presented in a well-defined organizational context. Supplementary statements designed to aid the listener in integrating the facts and arguments presented by the speaker did not increase the speaker's persuasiveness. These findings indicate that better comprehension of the main point of a communication does not necessarily imply greater acceptance of the speaker's recommendations.
- 50 Bowles, J.W. & Torr, D.V. An attitude survey of AFROTC cadets. November 1955. (AFPTRC-TN-55-40) (Project 7701, Task 77040). The survey revealed that AFROTC units differed significantly in the frequency with which their members stated an intention to volunteer for flying training. Differences appeared in the frequency with which freshmen, sophomores, juniors, and seniors indicated intention to accept flying training. The data indicated that favorable attitudes toward a military career and toward flying may be organized quite early, perhaps even before the cadet enters the AFROTC program. A large proportion of the cadets did not believe that they could pass the flight physical examination. Other evidence indicated that AFROTC cadets can appraise their physical qualifications with considerable accuracy. Screening methods have been adopted employing a flight physical and attitude measures, in addition to aptitude screening devices to eliminate cases most unlikely to succeed in flying training.
- 51 Tupes, E.C. Development of a test battery for joint selection of AFROTC and AROTC cadets. November 1955. (AFPTRC-TN-55-41) (Project 7701, Task 77044). A joint Air Force-Army research study, designed to provide a valid test battery of leadership ability suitable for the screening of applicants for ROTC scholarships, was undertaken. An experimental battery of 13 predictor instruments was administered to nearly 2300 senior (Class of 1953) AFROTC and AROTC cadets at 6 colleges and data on 2 criterion measures (leadership ability, military science grades) were obtained. The cross validity of the entire experimental battery was sufficiently high for the prediction of leadership (about .25) so that efficient screening could result. An unweighted combination of 2 tests (Aerial Orientation, Senior ROTC Personnel Inventory) would be only slightly less valid than the entire experimental battery. This would provide a short selection battery easily administered to groups of applicants, and easily scored. With a standardized rating scale and 10 to 20 raters per subject, even untrained raters were able to make ratings which, when averaged, had a high reliability. Ratings of leadership ability are moderately predictable from test scores.
- 52 Cross, K. Patricia & Gaier, E.L. Technique in problem-solving as a predictor of educational achievement. *J. educ. Psychol.*, 1955, 46, 193-206. November 1955. (AFPTRC-TN-55-46) (Project 7700, Task 77016, Contract AF 33(038)25726, Task A, University of Illinois). The Balance Problems Test is an attempt to measure the extent to which individuals select and make effective use of principles as opposed to factual information in problem solving. 6 sets of problems, containing 4

problems each, were constructed. Problems could be solved either through the application of one general principle applying to the entire set or through the use of successive, discrete facts. The BPT was administered to 39 high school students for whom indices of educational achievement and of general aptitude were available. By means of correlational analysis, the following conclusions were reached: (a) Those who took more mathematics courses in high school made more use of principles in the BPT; they use fewer facts, even though the use of principles appeared to require more time. (b) While the use of facts was considered the easier method of solution, those who used facts were less likely to obtain the correct answer. (c) Performance on the BPT is a good predictor of mathematics grades. (d) Science test scores are positively correlated with the number of BPT problems correctly solved. They are negatively correlated with the use of BPT facts.

- 53 Mason, H.M. A comparative evaluation of two approaches to job-knowledge test construction. *J. appl. Psychol.*, 1954, 38, 384-389. November 1955. (AFPTRC-TN-55-48) (Project 7700, Task 77016; Contract AF 33(038)25726, University of Illinois). As part of a task on the development and evaluation of job-knowledge tests, 2 tests for mechanics were constructed, one centered about knowledge requirements for engaging in the job and the other oriented toward experience that might be picked up while performing it. When these Airplane and Engine Mechanics tests were tried out in several squadrons, tests focused on experience were found to give experienced mechanics an advantage over inexperienced ones. Tests centering around information failed to make this discrimination. Both kinds of tests gave the following order of merit for groups with heterogeneous experience: first, mechanics on the job; next, mechanic trainees; and last, inductees.
- 54 Thistlethwaite, D.L. & Kamenetzky, J. Attitude change through refutation and elaboration of audience counterarguments. *J. abnorm. soc. Psychol.*, 1955, 51, 3-12. November 1955. (AFPTRC-TN-55-49) (Project 7705, Task 77115; Contract AF 33(038)25726, Task F, University of Illinois). This study investigates the comparative effectiveness of alternative communication procedures in changing attitudes of 2 independent samples. One consisted of 756 basic airmen and 400 high school students. Some of the communications explicitly refuted arguments the audience might raise against the presented thesis. Other communications presented the same facts and arguments but no explicitly refutative statements. In addition, the experiment compared the effects of elaborating vs not elaborating the major arguments of opposed members of the audience. Among the high school students, the effects of presenting explicit refutations were to (a) increase audience comprehension of the speaker's conclusion, and (b) elicit greater discounting (unfavorable appraisal) of the communication. Refutative and nonrefutative procedures were equally effective in changing attitudes. Among the airmen, explicit refutations increased neither comprehension nor discounting. Nonrefutative communication procedures were more effective. The one-sided communications which did not elaborate opposed arguments tended to be more effective in changing attitudes.
- 55 French, Elizabeth G. Interrelation among some measures of rigidity under stress and nonstress conditions. *J. abnorm. soc. Psychol.*, 1955, 51, 114-118. December 1955. (AFPTRC-TN-55-59) (Project 7704, Task 77092). This study is a comparison of performance under two differently structured emotional climates. 7 tests of rigidity, measuring different aspects of the variable, and a test of achievement motivation were given to 50 male airmen under ego-involved conditions and to 50 under relaxed conditions. The results include: (a) ego-involved conditions did not produce an increase in rigid behavior; (b) there was no evidence of a general interrelation between the various measures of rigidity; (c) ego-involved conditions produced no increase in interrelation between measures of rigidity; and (d) achievement motivation did increase under ego-involved conditions.
- 56 McQuilly, L.L. A method of pattern analysis for isolating typological and dimensional constructs. December 1955. (AFPTRC-TN-55-42) (Project 7700, Task 77016; Contract AF 33(038)25726, Task A, University of Illinois). This paper develops and illustrates a method of analyzing patterns of responses, similarity analysis, which permits interpretation of them as indicative of a limited number of inferred characteristics. It postulates merely inferred characteristics which may be either typological or dimensional in nature. The technique is applied to Air Force mechanics for isolating the dimensions peculiar to various categories of subjects and for determining which dimension is appropriate for the evaluation of each mechanic. Similarity analysis gives an optimal

solution; each pattern of responses is classified in that category which maximizes the relevancies of its responses to the category. The relevance of each response as an index of each inferred construct is quantitatively determined, and the constructs can be described in terms of the more relevant responses.

- 57 Price, B.P. & Schatz, H.H. Application of high-speed computation to factor analysis operations. December 1955. (AFPTRC-TN-55-64) (Project 7702, Task 77055; Contract AF 18(600)395, Southwest Research Institute). This report is concerned with programs for 5 different methods of factor analysis. These programs are general and can be made applicable to any of the various types of general purpose computers. Coding for input into the machine is the only additional step required before problems of this type can be solved with much greater accuracy in much less time than by other kinds of machine computation. These 2 advantages lead to a third, that of increasing the range of operations and the flexibility allowed the research worker when he must make a decision as to the kind of analysis he will employ for specific research problems.
- 58 Price, B.P. & Schatz, H.H. Application of high-speed computation to linear discriminant function operations. December 1955. (AFPTRC-TN-55-64) (Project 7702, Task 77055; Contract AF 18(600)395, Southwest Research Institute). The use of general purpose, digital computers involves 2 phases: (a) the programming phase, and (b) the coding and operation phase. This report concerns itself with the first phase of this problem. Ordinarily programs are general and can be coded for any specific machine, so that until a specific computer is selected to accomplish the computations, specific codes are not very practical. This report provides a general method for solving linear discriminant function problems through the aid of any of a variety of high-speed computers. The running time for the computations, after programming and coding have been accomplished, is such that solutions can be obtained for large problems quickly and economically.
- 59 French, Elizabeth G. Relation of an indirect measure of attitude to expressed military attitude. December 1955. (AFPTRC-TN-55-72, (Project 7704, Task 77099). In this study an objective indirect measure of attitude was developed and related to the direct measure currently in use. Some relationship was demonstrated between the 2 measures under conditions of experimental administration. In addition the indirect measure yielded similar distributions under experimental and operational conditions while the direct measure showed the expected higher mean and smaller variance under operational conditions.
- 60 Bowles, J.W. Preliminary analysis of the Thurstone Color-Form Dominance Test. November 1955. (AFPTRC-TR-55-1) (Project 7704, Task 77091). Development of valid selection and classification tests which tap the motivation and temperament aspects of personality has proved to be one of the most difficult test construction problems. The present report describes a preliminary analysis of an experimental device designed to measure motivation and temperament aspects of personality. The Thurstone Color-Form Dominance Test, as administered to 200 airmen, yielded 2 types of scores: one score reflected a tendency on the part of the subjects to perceive moving colors vs moving shapes; the other, a tendency to see apparent movement as either upward or downward. Analysis indicated that color vs form scores were markedly affected by seating position and that test-retest reliability was low. The vertical movement score was more stable and less affected by the position from which the subject viewed the test material. As such, it is more amenable to group-administered investigation and may warrant further study.
- 61 French, Elizabeth G. & Ernest, R.R. The relation between authoritarianism and acceptance of military ideology. *J. Pers.*, 1955, 24, 181-191. February 1956. (AFPTRC-TN-56-34) (Project 7704, Task 77093). This study is concerned with evaluating 2 scales and other psychological material as means for assessing the acceptance of military ideology under varying conditions. The California F-Scale, some additional items of the same kind, a Military Ideology Scale, and a question about Air Force career intentions were administered to 186 basic airmen at the beginning of training and again 6 weeks later. Half the subjects signed their papers and half answered anonymously. The hypothesis that F-Scale responses would be related to acceptance of military ideology was confirmed. The relationship was greater when only F-Scale items dealing with attitudes toward authority, conventionalism, and "hard-headedness" were used. F-Scale responses were unchanged by military



training. The combination of signed conditions and pressures of the first week of training produced higher F-Scale scores than the other conditions. The major findings were duplicated with an Officer Candidate School population.

- 62 French, Elizabeth G. Some characteristics of achievement motivation. *J. exp. Psychol.*, 1955, 50, 232-236. February 1956. (AFPTRC-TN-56-37) (Project 7704, Task 77101). This report suggests that typical level of achievement motivation is a significant variable affecting the degree to which a desired level of motivation can be aroused by introducing appropriate cues into the situation; that this resultant motivation can be independently measured; and that it is related to performance. The findings suggest that an independent measure of motivation and a knowledge of the characteristics of the stimulus situation are both essential for predicting performance. It is possible, to some extent, to identify in advance which individuals are more likely to increase output under varying sets of stimulus conditions.
- 63 Zaccaria, M.A., Dailey, J.T., Tupes, E.C., et al. Development of an interview procedure for USAF officer applicants. February 1956. (AFPTRC-TN-56-43) (Project 7701, Task 77022). An interview procedure and report form were developed suitable for all Air Force officer procurement programs wherein selection is based upon the findings of an interview board. The procedure is suitable for 3-man boards with little prior training, and is designed to furnish a reliable estimate of officer potential but not of technical proficiency or any other area which is better measured by test material or evaluation reports of past performance. 3 tryouts, 2 using cadets in the AFOTC training program as interviewees and the third using applicants for pilot training, were useful in revising the preliminary procedure and providing estimates of the reliability and validity of scores yielded by the procedure. The interview procedure yielded fairly reliable evaluations, but they were only slightly related to leadership ability. On the basis of these findings it is clear that: (a) the interview will not be useful in procurement programs where other kinds of measures of officer leadership potential are available, and (b) it should be used only as a screening instrument to eliminate the small percentage of applicants obviously lacking officer leadership potential.
- 64 French, Elizabeth G. Development of a measure of complex motivation. April 1956. (AFPTRC-TN-56-48) (Project 7704, Task 77101). The report describes the development of an independent measure of complex motivations for use in studies of the role of such motivations in performance. From a trial administration of 50 verbal stimulus items, which permitted but did not require achievement and affiliation responses two parallel 10-item forms of the test were constructed. Scoring categories were developed and refined until satisfactory inter-rater agreement was reached. Scores on early forms of the test were correlated with questionnaire items pertaining to behavior considered dependent in part on the motives studied. Presented to Preflight cadets as a Test of Insight, the test elicited achievement and affiliation oriented responses for which a reliable scoring system was developed. While motivation scores on preliminary forms were uncorrelated with observers' judgments of motivation and goal attainment, the judgments of both motives correlated (.82) with observed goal attainment. Test of Insight scores showed low (.19) but consistent and significant correlations with sentiment and questionnaire responses pertaining to achievement and affiliation.
- 65 Moosh, J.E. Systematic observation of instructor behavior. May 1956. (AFPTRC-TN-56-52) (Project 7959, Task 77243). From observation in technical school classroom situations, 3 short check lists were constructed. These forms were designed to facilitate the observing of instructor verbal behavior, instructor nonverbal behavior, and student behavior. After extensive tryout, 35 items were retained where (a) 2 or 3 airman observers agreed on the frequency of occurrence of the behavior, and (b) where an instructor's behavior tended to be consistent over time. 3 senior airman observers used the lists in conducting half-hour observations of 120 hydraulics instructors. 3 criteria, student gains, student ratings, and supervisor ratings, were correlated with each of the 35 instructor and student behavior items to find which items best predicted each criterion. Certain student behaviors were related to student achievement, certain instructor behavior items were related to supervisors' ratings. Items on the Instructor Verbal Behavior, Instructor Non-Verbal Behavior, and Student Behavior check lists were not significantly related to one another. Student learning of subject matter was predicted better from student behavior, especially inattentive behavior, than from instructor behavior in the classroom.

- 66 Hazzman, H.J. & Morsh, J.E. The aviation mechanic testing program in the operational commands. May 1956 (AFPTRC-TN-56-53) (Project 7950, Task 79504). A method for determining where training is needed, and who needs training, was considered essential in providing information for planning a training program. Diagnostic testing instrument: answer this purpose. The purpose of this report is to describe the development and use of some of these instruments. Principles guiding the development of a diagnostic instrument were: (a) Tests must reflect day-to-day job duties rather than broad general principles. (b) Separate diagnostic scores that reflect logically discrete areas of the job must be provided. (c) Broad coverage of duties is required so that a maximum of information can be given. (d) Standards of performance must be provided. (e) A simple procedure for interpreting test scores is necessary. Based on experience with interview-type examinations administered by highly skilled mechanics, 2 sets of objective, multiple-choice examinations were developed, the Written Evaluations of Mechanics' Proficiency (WEMPs) and Training Needs Tests (TNTs).
- 67 Morsh, J.E. & Schmid, J., Jr. Supervisory judgment as a criterion of airman performance. May 1956 (AFPTRC-TN-56-56) (Project 7950, Task 79505). The purpose of the present investigation was to see to what extent supervisors' ability to estimate their airman subordinates' job knowledge is related to supervisors' own job knowledge, rank, education, and attitude. Supervisors' attitude toward the Air Force was determined by a questionnaire completed by supervisors in 4 career fields. Airmen's attitude toward their supervisors was obtained from pertinent items of a Job Satisfaction Inventory. Supervisors and the men they supervised completed the Training Needs Test for their specialty to measure their proficiency on jobs of the career ladder. A "leniency of rating" score was obtained for each supervisor by subtracting scores his airmen obtained in each test from the scores as estimated by the supervisor. Results showed that: supervisors' estimates of airmen's test scores agreed to some extent with scores airmen received; supervisors were more lenient with men they knew longer; the higher the supervisors' rank the more severe they were in rating the job knowledge of their men; supervisors' accuracy of rating increases with their knowledge of the job; supervisors' job knowledge is related to their education and to their rank; and supervisors' attitude toward the Air Force becomes more favorable with increase in rank.
- 68 Nolan, C.Y., Ratliff, F.R., & Richey, H.W. The Airmen's Proficiency School: An approach to the problem of adaptation and motivation in the Air Force. May 1956. (AFPTRC-TN-56-57) (Project 7950, Task 79507). This report deals with some effects of training designed to adapt and motivate airman personnel. 3 attitude scales and a statement of reenlistment intent were administered to 895 airmen in 13 classes before and after training in the Airmen's Proficiency School. Changes in attitudes, class differences, and significant interactions were assessed by analysis of variance techniques. Attitudes of the airmen toward the school and its goals were generally favorable. Although results were not always consistent between classes, small but statistically significant gains were shown on the scales measuring Air Force ideology and feelings of security in the Air Force. Hypothesized changes in attitudes toward NCOs and reenlistment were not demonstrated.
- 69 Hagen, Elizabeth P. & Thorndike, R.L. Follow-up study of Air Force examinees. May 1956. (AFPTRC-TN-56-58) (Project 7701, Task 77038; Contract AF 33(038)-13474, Teachers College, Columbia University). Records of Air Force aptitude test scores have been accumulating for aircrew training applicants since 1942. If it is practicable to obtain information about civilian careers of large occupational groups of former aircrew applicants, it then becomes possible to determine the precision and stability of long-range prediction from aircrew classification tests. Starting with 9-year-old testing records of 1500 applicants, civilian addresses were located for 77%. Questionnaires were returned by 65% of them, or over 50% of the original rosters. Reported civilian occupations were distributed among 154 job categories, but only 25 categories had as many as 10 reporting. Profiles of test score averages for the larger groups indicate that in a full-scale survey the aptitude tests might show discriminations both between occupations and between the most and least successful groups within occupations. Feasibility of a large scale survey has been demonstrated. This report provides information for determining size, design, and techniques of such a survey.

- 70 Hausman, H.J. & Goldberg, S.C. Nontechnical factors in the job performance of aircraft mechanics: Study II. May 1956. (AFPTRC-TN-56-59) (Project 7950, Task 79507). This study is an attempt to define with more precision some of the content in self and supervisors' ratings by looking beyond general factors. Supervisor ratings were secured from 20 crew chiefs and self-ratings from 85 mechanics. Assistant crew chiefs completed both rating forms. From factor analysis of the ratings, 5 relatively independent dimensions of self-rated attitudes toward the job were identified, but no general factor of "morale" was found. The supervisors' ratings of mechanics showed a bifactor structure. Each item rated by a supervisor contained a large component of halo and an appreciable component of a major trait apparently related to the verbal content of the item. The element of friction vs smoothness in his relations with a subordinate seemed to affect the supervisor's ratings for that subordinate on all traits, thus accounting for the halo effect. 4 factors in addition to the general factor were identified. Composite trait scores from supervisors' ratings were highly intercorrelated, but an underlying "things vs people" structure explained the relationship of rated traits, with a work-oriented traits cluster distinguished from a social elements cluster.
- 71 McReynolds, Jane. Development of motivation keys for the Armed Forces Qualification Test Forms 3 and 4. May 1956. (AFPTRC-TN-56-60) (Project 7700, Task 77000). Special scoring keys for the Armed Forces Qualification Test (AFQT) were required to assist in detecting those men who might be deliberately failing the mental qualification test to avoid military service. 2 keys were developed for AFQT Forms 3 and 4. Key I was based on a comparison of the responses made by a group of marginal-ability airmen who were trying to pass the test with those made by a group of Category I, II, and III airmen who had been instructed to fail the test. Key II was based on a comparison of the marginal group with a group of Category IV men who were told to fail the test. Incorrect responses favored by the intentional failures were keyed. 2 independent samples, one of failing applicants and one of basic airmen were used for cross validation of the keys. On the basis of correlational analysis, Key I was preferred for both AFQT-3 and AFQT-4. Only 17% of the intentional failures for AFQT-3 fell in a doubtful classification and 22% for AFQT-4. It was less effective for the Examining Station sample, at 48% for AFQT-3 and 54% for AFQT-4 were in the doubtful classification.
- 72 Davis, F.B. The construction of spatial orientation items by means of a cyclorama. June 1956. (AFPTRC-TN-56-61) (Project 7701, Task 77046; Contract AF 18(600)358, Test Research Service). An accurate technique was required for simulating aerial photographs in constructing new forms of an aircrew selection test. A cyclorama was designed and constructed to represent the visual field of an observer in a Piper Cub at an altitude of 250 feet. Key points and lines in the terrain were projected on the walls of a cyclorama to guide the artist in making the perspective drawing. A special camera mount, scaled for precise angular adjustment, provided for rotary motion in 3 dimensions about the fixed point of the observer. 2 spatial orientation tests were constructed from cyclorama photographs. Statistical analysis shows that the new tests measure in large part the same functions as the previous test, but that they are more closely related to each other than to the old test. In developing personnel tests that require aerial views of terrain, photographing within a cyclorama is a practical compromise between direct photography and independent drawing.
- 73 Norris, R.C. Development of an efficient set of dimensions for description of Air Force Ground-Crew jobs: Part I. Rating dimensions. June 1956. (AFPTRC-TN-56-62) (Project 7700, Task 17000; Contract AF 33(038)13474, Teachers College, Columbia University). To identify the significant independent dimensions of Air Force enlisted jobs, 150 jobs were rated by 4 professional psychologists with respect to 170 attributes. A set of 130 attributes were chosen as meeting minimum standards for importance and reliability of rating. The intercorrelation matrix was factor analyzed by Thurstone's "diagonal" method to identify the common dimensions. Traits which were quite reliable but independent of the common dimensions were identified by multiple correlation techniques. 11 common factors and 7 additional attributes made a set of 18 dimensions which provide a framework for describing the requirements of Air Force enlisted jobs.

- 74 Thistlethwaite, D.L., Kamenetzky, J., & Schmidt, H. Factors influencing attitude change through refutative communications. *Speech Monogr.*, 1956, 23, No. 1, 14-25. June 1956. (AFPTRC-TN-56-64) (Project 7705, Task 77115; Contract AF 33(038)25726, University of Illinois). The focus in these studies was the immediate reactions of the audience (college men) to tape-recorded speeches as revealed by a program analyzer. In the first study, 2 variables were studied: (a) explicitly refutative vs implicitly refutative communications; and (b) 1-sided vs 2-sided communications. In the second study, the variables were: (a) climax vs anticlimax order of presentation of explicit refutations; and (b) use of second-person vs use of third-person grammar in describing the source of the counter-arguments refuted. Questionnaires were administered to determine opinions on relevant topics and tendency to discount the communication. In the first study, 2-sided presentations of refutations tended to arouse antagonism. While the communications as a whole proved persuasive, there were no differences in the effectiveness of the different types of communications in changing the opinions of opposed subjects.
- 75 DuBois, P.H., Loevinger, Jane, & Smith, T.L., Jr. Evaluation of methods of keying psychological tests for prediction of external criteria. With Appendix by Tucker, L.R., DuBois, P.H., & Smith, T.L., Jr. Scoring item punched cards by selector networks. June 1956. (AFPTRC-TN-56-65) (Project 7702, Task 77062; Contract AF 18(600)370, Washington University). The 4 objectives were: to develop tests by 4 methods of empirical selection from a pool of heterogeneous items; to develop tests by homogeneous clustering of the same pool of items; to compare the effectiveness of the tests in predicting an external criterion; and to devise computing techniques for handling large masses of item data by means of punched cards. All the experimental keys were developed on one sample of 1000 aircrew cadets and cross validated on the second sample. All 4 methods of empirical keying yielded about the same cross validities. Hence the simplest procedure, selection by highest correlation or covariance with the criterion, can be used. Validity of the tests constructed by these methods did not differ from the multiple correlation estimated from the 4 homogeneous keys. The machine procedures developed for analysis and scoring of items by selector networks double the item capacity of the IBM punched card.
- 76 Mason, H.M. A further study of experience-centered and requirements-centered tests of job knowledge. *J. appl. Psychol.*, 1956, 40, 14-16. June 1956. (AFPTRC-TN-56-66) (Project 7700, Task 77016; Contract AF 33(038)25726, University of Illinois). A previous study investigated the relative merits of 2 approaches to constructing items that test knowledge gained through experience as an aircraft and engine mechanic. This study is a repetition of the first investigation in another setting. 2 experience-centered and 3 requirements-centered tests were developed from statements of technical knowledge requirements. Test validities were determined by comparing test means for mechanics from 3 levels; apprentice, senior mechanic, and supervisor-technician. Analysis of variance was used to determine the significance of relationships between test means and skill levels. 5 tests were significantly related to the criterion of level of job skill. One of the experience-centered tests, *Maintenance Facts*, had the highest validity. Observed differences favored the other experience-centered test over the requirements-centered tests. Results are in agreement with those of the previous study. Experience-centered job knowledge tests for aircraft and engine mechanics have greater validity than requirements-centered tests when the criteria are job skill levels.
- 77 Berkeley, M.H. & Brokaw, L.D. Stability of WAF attitudes as measured by WAF attitude survey BE-CE501GX. June 1956. (AFPTRC-TN-56-72) (Project 7705, Task 77113). To determine differences in WAF attitudes at 2 stages of Air Force service, a questionnaire survey was administered to 196 WAF in basic training and readministered to the same WAF as permanent party on several Air Force bases at a later date. The survey provides 16 scales which cover the following areas: motives for joining the Air Force, civilian and military attitudes toward WAF, personal status, reenlistment intentions, adequacy of training, housing, recreation, superior-subordinate relationships, and inter-personal relations. Significant shifts in attitude were found from the basic training to the on-the-job situations. The permanent party WAF is more concerned with the working and living aspects of the situation than she is with its strictly military components. She accepts the arbitrary structure of military authority and is not too distressed by the barracks life. She is less happy about her work situation, her job and the training she got for that job, and her educational and recreational opportunities.

- 78 Morsh, J.E. Development of the Written Evaluation of Mechanics' Proficiency (WEMP) measure for B-50 aircraft. June 1956. (AFPTRC-TN-56-75) (Project 7950, Task 79500; Contract AF 18(600)82, Personnel Research Institute, Western Reserve University). It was necessary to develop a measure for determining which B-50 mechanics need training and to identify those job areas in which a mechanic most needs training. For each WEMP, a test outline was set up, subject matter experts were selected and trained, items were constructed, and experimental forms were tried out. From item analyses of difficulty and discrimination, a final form was constructed. From administration to appropriate groups of airmen, reliabilities, validities, and conversion tables were determined. Reliability of diagnostic areas ranged from .48 to .86, with the median reliability of differences .38. Area validities for supervisor ratings averaged around .35, and for mechanics' military grades around .60. Use of the test as a diagnostic measure to provide information for planning on-the-job training of B-50 mechanics appears warranted.
- 79 Bryant, N.D. A factor analysis of the Report of Officer Effectiveness (Form 77A). June 1956. (AFPTRC-TN-56-77) (Project 7701, Task 77042). This report presents an analysis of officer ratings on a detailed check list to determine the extent to which the ratings differentiate activity areas. The 54-item Air Force Form 77A was completed by 2 superiors for each of 411 male OCS graduates at the end of 6 months on-the-job training in a basic military training squadron. The 2 ratings on the 54 variables were pooled and intercorrelated. Factors were extracted by the centroid method. Graphic rotation to simple structure was unsatisfactory, and a multiple-group solution gave the basis for inferring dimensions of the rating form. A general factor accounted for most of the correlation among the 54 items. 5 group factors were tentatively defined by the relationships among separate clusters of the check list items interpreted as: I, conforming to the prescribed role of the responsible officer; II, proficiency in intellectual tasks; III, getting along with people; IV, proficiency in supervising personnel; and V, facility in communication. These concepts of aspects of an officer's job seem at least as defensible as the *a priori* categories of Form 77A.
- 80 Richey, H.W. & Ratliff, F.R. The prestige of Air Force career fields. June 1956. (AFPTRC-TN-56-78) (Project 7950, Task 79505). It was hypothesized (a) that prestige values are attached to Air Force career fields and that a career field prestige hierarchy can be reliably established, and (b) that the rank order of career fields on prestige by airman, NCO, and officer judges will be similar. 3 groups (50 airmen, 48 NCOs, and 50 company grade officers) rated 38 career fields on prestige. Reliabilities of the ratings were determined. Career field prestige rankings established by the 3 groups of raters were intercorrelated to compare agreement among the rater groups. Agreement was almost complete among the 3 groups regarding the prestige order of 38 career fields. Career fields with titles and duties implying professional and semi-professional status received the highest ratings. Intermediate ratings were given career fields engaged in skilled, clerical, and distribution functions. Those career fields concerned with semi-skilled and unskilled services stood low on prestige.
- 81 Mitra, S.K. & Fiske, D.W. Intra-individual variability as related to test score and item. Educ. psychol. Measmt, 1956, 16, 3-12. June 1956. (AFPTRC-TN-56-80) (Project 7704, Task 77090; Contract AF 18(600)601, University of Chicago). This paper is concerned with the difference between the 2 responses of an individual to the same test item at 2 points in time. An interests questionnaire and a self-rating adjective check list were administered to 118 aircrew cadets twice with a 10-week interval. Both tests had a test-retest reliability of at least .70. Variability scores and reliabilities (K-R 20) were computed for both test scores and item responses. For a set of relatively homogeneous items, there were reliable individual differences in variability. For a group of persons, the more homogeneous their responses to an item, the less variability for that item. For a set of items, the total test score was related to response variability; individuals with low scores tended to have high response variabilities, those with high scores tended to give the same response on both testings. The finding that some of a test's error variance is correlated with its reliable variance indicates that the usual estimates of a test's reliability need modification. The relationship between variability scores and scores on the inventories suggests that response variability is a measureable personality trait that may have significance for personnel selection and classification.

- 82 Osterweil, J. & Fiske, D.W. Intra-individual variability in sentence completion responses. *J. abnorm. soc. Psychol.*, 1956, 52, 195-199. June 1956. (AFPTRC-TN-56-71) (Project 7704, Task 77090; Contract AF 18(600)601, The University of Chicago). This study investigated the nature and amount of response changes on a projective test where responses are free rather than multiple choice; and explored relationships between variability and certain stimulus characteristics. The same test was given on 2 occasions to 4 groups (93 subjects) of college students. 2 Normal groups were given instructions which suggested that the study concerned group attitudes. The Good Adjustment group was instructed to create a favorable impression, the Bad Adjustment group an unfavorable impression. Judges classified responses into sets of similar or equivalent completions; and into Popular, Common, and Unique responses. Judges then classified the second response as similar to or different from the first response. Content of the majority of responses changed on retest, Unique responses were changed more frequently than Common or Popular responses, and persons who gave many unique responses had higher change scores than persons who gave few unique responses. These findings were true for all groups.
- 83 Staudohar, F.T. & Smith, R.G., Jr. The contribution of lecture supplements to the effectiveness of an attitudinal film. *J. appl. Psychol.*, 1956, 40, 109-111. June 1956. (AFPTRC-TN-56-82) (Project 7705). To determine the effect of brief lecture supplements on expressed attitudes toward discipline, 3 lectures were developed for use with the commercial motion picture *Twelve O'Clock High*. All stressed scenes in the film thought likely to produce favorable attitudes toward discipline in military service. 4 groups of basic airmen served as subjects. One group was lectured prior to viewing the film; the second was lectured after the film; the third was given both an introduction and review; and the fourth was the control group which received no lecture. Attitudes toward discipline were measured by a brief questionnaire. Analysis of variance and differences between mean scores of the control and experimental groups showed that airmen who heard one of the lectures with the film expressed more favorable opinions concerning military discipline than those who had seen the movie without a lecture. None of the lectures was more effective than any other. Supplemental lectures provide a simple means for making more effective use of films which are already pertinent to a given attitude.
- 84 McReynolds, Jane. Mental qualification tests for women of the Armed Forces. June 1956. (AFPTRC-TN-56-87) (Project 7717, Task 87001). All services use the Armed Forces Qualification Test (AFQT) for screening enlisted personnel. Recent forms minimize verbal skills and maximize mechanical training or experience, and are designed to have the greatest precision of measurement around the low qualifying score used for male enlistees. These characteristics were inappropriate for female personnel and the Air Force was asked to develop a selection instrument for women. Because women in military service tend to be given clerical and administrative assignments, verbal and quantitative items were selected, on the basis of item analysis data, for 2 parallel forms of 100 items each. Shorter forms were developed for prescreening to help recruitment personnel select applicants likely to qualify on the longer tests. The Armed Forces Women's Selection Test, Forms 3 and 4, provides, in addition to a total score, a verbal score and a quantitative score which are reliable enough to be used separately.
- 85 Nolan, C.Y. Attitude differences among disparate Air Force specialties. June 1956. (AFPTRC-TN-56-88) (Project 7950, Task 79507). This paper reports a preliminary investigation of motivation to determine whether (a) skilled job groups with readily identifiable and lasting products have greater job satisfaction than those without such products; (b) individuals in jobs without such products as compared with those in jobs with products, make higher scores on measures of Air Force ideology; (c) individuals in jobs where incumbents are characterized by low intelligence and aptitudes will have a more favorable opinion of the economic opportunities of the Air Force and will desire closer supervision on the job than those in other groups. Groups of 52 airmen in the top 4 pay grades were selected from 5 career fields: Armament Systems Maintenance, Aircraft and Engine Maintenance, Food Service, Supply, and Administrative. Mean scores were derived from 8 short attitude scales (Affective Feeling Toward NCOs, Economic Opportunity in the Air Force, Feeling of Security in the Air Force, NCO Leadership, Air Force Ideology, Job Satisfaction, Amount of Supervision Desired on the Job, and Authoritarianism) and an expression of reenlistment intent. Differences among groups were found for reenlistment intention and for all except one (Affective Feeling Toward NCOs) of the attitude scales.

- 86 **Gragg, D.B. & Douglass, H.J.** Conversion tables for selected Airman Classification Battery scores and comparable scores on other selected service and civilian tests. June 1956. (AFPTRC-TN-56-89) (Project 7700, Task 77004). Tables are provided for converting scores in the General, Mechanical, and Clerical aptitude areas under which Air Force specialties may be assigned with reasonable accuracy. They may be used whenever there is a requirement for transforming scores on tests used by the Army or Air Force into equivalent scores in terms of tests used by the other service for classification, estimation of manpower pools, and standardizing new testing instruments.
- 87 **Travers, R.M.W.** Personnel selection and classification research as a laboratory science. *Educ. psychol. Measmt.*, 1956, 16, 195-208. July 1956. (AFPTRC-TN-56-96, ASTIA Document AD-098 872) (Project 7719, Task 17011). This paper reviews some of the problems involved in predicting achievement from aptitude tests. Despite all the work in specific areas of predicting achievement, only small advances have been made in precision of predictions. Advances are represented by extension of the area in which predictions can be made rather than improved accuracy of prediction. One difficulty is that current validation procedures do not easily permit discovery of many variables which now limit accuracy. An approach is suggested through which laws of behavior can first be discovered under laboratory conditions and inferences from these laws be validated in field studies. A difficulty in this approach is that most criteria of proficiency in field conditions represent proficiency after extended learning, but laboratory criteria represent proficiency after only a limited period of learning.
- 88 **Buckner, D.N.** Construction of a proficiency examination for maintenance personnel on a new weapon system. August 1956. (AFPTRC-TN-56-105, ASTIA Document AD-098 880) (Project 7950, Task 17075; Contract AF 18(600)1352, Human Factors Research, Inc.). The problem of this investigation is to determine the feasibility of constructing job-knowledge examinations early in the procurement period. Test construction procedures used in developing the Written Examination of Mechanical Proficiency (WEMP) were employed except that in the initial stages the assistance of an aircraft manufacturer was obtained. Until now, technical assistance for the construction of WEMP examinations has come from Air Force personnel experienced in the maintenance of particular equipment. Suitable test outlines and items were developed for 2 examinations on maintenance of B-52 aircrafts, one for general mechanics and one for engine mechanics. To provide proficiency examinations on important new weapon systems even earlier, initial phases of test development can be carried out at the manufacturer's plant before Air Force personnel arrive for factory training. Trial administration will be with personnel attending the factory course and the final revision will be made after administration to the first operational unit.
- 89 **Votaw, D.F., Jr.** Review and summary of research on personnel classification problems. August 1956. (AFPTRC-TN-56-106, ASTIA Document AD-098 881) (Project 7702, Task 77057; Contract AF 18(600)369, Yale University). The report is divided into 3 sections; definition of the problem, methods of solution, and problem areas. In the first section, 2 main problems are defined: (a) Given a number of job categories with preassigned quotas, and given a group of persons for each of whom an amount of production in each job is known, the problem is to allocate persons to jobs so that production per person is a maximum. (b) Given a number of job categories with quotas and a group of persons, where each person is regarded simply as qualified or not in each job category, the problem is to find, if one exists, some allocation that will place each person in a job for which he is qualified. 10 methods of solution are listed, referenced, and discussed briefly in nonmathematical terms in Section 2. Section 3 summarizes present knowledge and suggests further research.
- 90 **Zaccaria, M.A., Schmid, J., Jr., & Klubeck, S.** A simple procedure for developing equivalent forms of interest or personality questionnaires. *Psychol. Reps.*, 1955, 1, 37-41. August 1956. (AFPTRC-TN-56-107, ASTIA Document AD-098 882) (Project 7701, Task 77047). This paper reports a method for developing parallel forms of tests having scaled items ("like," "indifferent," "dislike") such as are commonly found in attitude, personality, and interest inventories. A preliminary form of the Officer Activity Inventory was administered to 591 newly-commissioned

officers. Items for the 2 forms were paired, using 3 criteria: (a) pattern of correlations of the 3 responses with the subtest score; (b) popularity level of the "like" response; and (c) item content. Both forms, each with 16 subtests of 12 items each, were completed by the 512 members of OCS Class 52D. Applying Votaw's test of compound symmetry to the test data, it was found that only 3 of the 16 pairs of subtests failed to meet this rigid test of equivalence.

- 91 Brokaw, L.D. Technical school validity of the Airman Activity Inventory. August 1956. (AFPTRC-TN-56-109, ASTIA Document AD-098 884) (Project 7700, Task 77012). This study was performed to determine whether a specially constructed job interests inventory could add to the validity of the Airman Classification Battery in predicting technical school success. The 200-item instrument was administered with other experimental tests for validation against technical school grades. From the original sample who took the tests as basic airmen, graduates were selected from 13 schools representative of 6 aptitude clusters. The activity areas covered by the Inventory yielded validity coefficients which displayed little relationship to the intended job cluster. Sometimes validities for schools outside the cluster were higher than for those within the cluster. It is doubtful that material of this kind can make substantial contribution to a battery of aptitude measures.
- 92 Gaier, E.L., McQuitty, L.L., & Cherry, C.N. A procedure for developing job-knowledge tests. September 1956. (AFPTRC-TN-56-113, ASTIA Document AD-098 888) (Project 7700, Task 77016; Contract AF 33(038)25726, Task A, University of Illinois). The procedure was developed for groups selected in terms of aptitude and job knowledge and little relationship exists between job knowledge and proficiency on the job. Three 100-item job-knowledge tests, prepared from a pool of 12,668 mechanical test items, were administered to 645 Aircraft and Engine Mechanics grouped at 4 levels of formal training and work experience. Item responses were analyzed for power to differentiate between the 4 groups. The number of subjects passing many of the items increased with increased training or experience, but the reverse also occurred for a few items. The degree of significance of items in differentiating between groups of subjects was related to the parts of the airplane with which the items are concerned. Job knowledge taught in various phases of a course was differentially related to both the parts of an airplane and to the significance of items for differentiating subjects at various levels of training and experience. Subjects at different levels of training and experience did not show significant differences in aptitude. Accordingly, the differentiating power of the job-knowledge items is here attributed to differential learning and forgetting rather than to selective attrition.
- 93 Cox, J.A., Jr. & Christal, R.E. Development and validation of the Pilot Instructor Selection Examination. September 1956. (AFPTRC-TN-56-114, ASTIA Document AD-098 889) (Project 7701, Task 77036). Based on a review of previous research, 6 tests were constructed as potential predictors of success as flying instructors. These were administered to student pilots and student instructors along with the Aircrew Classification Battery. Grades from Pilot Instructor School and ratings by students, fellow instructors, and supervisors were correlated with test scores. It was found that test scores will predict grades in Pilot Instructor School, but are unrelated to the ratings of success as an instructor. Scores from the Pilot Instructor Selection Examination can be used effectively to select from graduates of basic pilot training men who will be successful in Pilot Instructor School, but these men are no more likely than unselected pilots to be rated high by their students, fellow instructors, or supervisors.
- 94 Gunn, R.L. An empirical study of the Job Components Check List. October 1956. (AFPTRC-TN-56-123, ASTIA Document AD-098 897) (Project 7950, Task 79500; Contract AF 18(600)82, Western Reserve University). This study was designed to obtain both job-defining information and criteria of performance for B-36 dock reciprocating-engine mechanics by means of 3 job components check lists: the Task Difficulty Check List; the Frequency of Performance Check List; and the Task Assignment Check List. The Frequency of Performance and Task Assignment Check Lists were administered to a sample of 140 B-36 dock engine mechanics and to 36 of their immediate



supervisors (engine chiefs). The Task Difficulty Check List was administered to 100 dock mechanics and to 50 dock supervisors. The Frequency of Performance Check Lists were factor analyzed to determine the job-defining function of the technique. The results indicated that the B-36 dock mechanic's job was not homogeneous. 5 factors were extracted which suggest that the job has "functional" divisions as well as "systems" divisions. These factors were differentially related to such variables as rank, experience, mechanical aptitude, and performance on the Written Evaluation of Mechanics' Performance (WEMP) B-36.

- 95 French, Elizabeth G. & Chadwick, Irene. Some characteristics of affiliation motivation. November 1956. (AFPTRC-TN-56-126, ASTIA Document AD-098 898) (Project 7704, Task 77101). A measure of affiliation motivation, a projective test, was administered to 144 male students in Officer Candidate School. 2 groups were equated on affiliation motivation score and on popularity as measured by a sociometric questionnaire. One group was given a second form of the test after completing a questionnaire designed to heighten affiliation motivation, and the other was given the second form following a neutral activity. Specific hypotheses were tested by analysis of variance of the scores for various subgroups and by chi-square comparisons of positive and negative responses. The results, which confirmed hypotheses, indicated that increasing affiliation cues in the environment produced an increase in the measure of affiliation motivation and that subjects who had initial high scores were more responsive to the stimuli than were subjects whose original scores were low. Popularity level was not related to overall level of affiliation motivation but it determines the extent to which the subject is goal- or threat-oriented.
- 96 Massey, Ins H. & Creager, J.A. Validation of the Airman Classification Battery: 1949-1953. November 1956. (AFPTRC-TN-56-129, ASTIA Document AD-098 903) (Project 7700, Task 77006). This report summarizes the available data on the validation of the Airman Classification Battery from 1949 to 1953. Validation is carried out by correlational techniques, including factor analysis, and by experimental methods designed to assess the effects of various testing conditions. Regression analyses are continuously carried out using both training and proficiency criteria. The use of training criteria predominated during the period covered by this report. Occasional validation against phase criteria is used to keep abreast of changing requirements and to study heterogeneity of function within a specialty area. Considerable improvement in manpower utilization has been effected with this battery. Evidence demonstrates the batteries to be reliable instruments with validity for a wide variety of training criteria. Factor analytic studies indicate excellent coverage of verbal, numerical, and mechanical functions, but the need for greater coverage of spatial and reasoning abilities. Some differential validity is demonstrated which is limited by high intercorrelations among the aptitude indexes.
- 97 Chorness, M.H. & Nottelmann, D.A. The predictability of creative expression in teaching. December 1956. (AFPTRC-TN-56-130, ASTIA Document AD-098 905) (Project 7703, Task 77085). An attempt was made to relate scores derived from Guilford's creativity test battery to aspects of creative behavior in the teaching medium. 52 students were observed as they conducted lecture-discussion sessions at the Pilot Instructor School and rated on criterion areas considered demonstrative of creativity in instruction. Tests of creativity predicted grades in Pilot Instructor School as well as, but not significantly better than, intelligence test score. The same was true for prediction of the ratings of creativity.
- 98 Wrigley, C., Morsh, J.E., & Twery, R. A factor analysis of the Air Force Factor Reference Battery I. December 1956. (AFPTRC-TN-56-137, ASTIA Document AD-098 913) (Project 7700, Task 77016; Contract AF 33(038)25726A, University of Illinois). A factor reference battery was designed to provide for effective assessment of aptitudes of Air Force personnel and to determine the relationship of several factors to proficiency evaluation in shorter time than is required for the usual aptitude battery. The 14 tests were administered to 162 experienced B-47 aircraft and engine mechanics. A factor analysis yielded 11 significant principal axes factors which were rotated by the quartimax method. The common variance possessed by each test was determined by calculating the

multiple correlation between each test and the other tests in the battery. 10 factors were interpreted as: Sensori-Motor Speed, Spatial Aptitude, Fluency, Induction, Verbal Aptitude, Clerical Speed, Mechanical Knowledge, Associative Memory, Deduction, and Perceptual Reorganization. On the basis of factor loadings and multiple correlations, it is suggested that Visualization, Motor Speed, Perceptual Speed, and Word Fluency tests be eliminated from the battery. The Verbal Knowledge and Mechanical Knowledge tests proved too easy and the Object Completion test too difficult for the subjects of this study.

- 99 Zaccaria, M.A., Tupes, E.C., & Lawrence, H.G. Development and characteristics of the USAF Officer Activity Inventory. January 1957. (AFPTRC-TN-57-15, ASTIA Document AD-098 927) (Project 7701, Task 77047). Development of an activity interest inventory is a first step toward bringing the area of interest testing to the level of aptitude testing for use in officer selection and classification. Materials from military and civilian job descriptions, Air Force classification manuals, and interviews with officers formed the basis for writing 606 items, allocated to 16 *a priori* subtests. From these, 2 alternate forms with 12 items in each subtest were constructed. From administration to newly-commissioned AFROTC officers, reliability and validity for selected criteria were estimated and shortened alternate forms were derived. Subtests of both the original and shorter forms are highly reliable and sufficiently independent with respect to each other and to aptitude and achievement tests to contribute to the usefulness of an officer classification battery. Preliminary studies show the subtests to be valid predictors of performance in some officer schools, but the validity coefficients were low.
- 100 Christal, R.E. & Krumboltz, J.D. Prediction of first semester criteria at the Air Force Academy. January 1957. (AFPTRC-TN-57-17, ASTIA Document AD-098 920) (Project 7719, Task 17009). This report provides an evaluation of the measures used in selection of the class of 1959 in terms of course grade criteria. The predictors were the 1955 Air Force Officer Qualifying Test (AFOQT), several College Entrance Examination Board tests, and some background variables. First semester grades in Academy courses and the Academy Aptitude for Commissioned Service rating are the criteria. Inter-correlations of predictors and criteria for the 271 cadets who completed the first semester, and intercorrelations of predictors for the 2610 physically qualified applicants are provided. The prediction instruments effectively predict course grades, but not the Aptitude for Commissioned Service rating. Reported validities are conservative estimates of the "true" validity because of the restricted range of talent found in the selected cadets. Additional tests measuring interests, abilities, and personality are needed to improve prediction in the few areas where validities are low.
- 101 Smith, R.G., Jr & Cox, J.A., Jr. Methods of reduction of psychological stress due to radiation. February 1957. (AFPTRC-TN-57-19, ASTIA Document AD-098 922) (Project 7734, Task 17103). The report records the results of a survey of current industrial practices with respect to the problem. No attempt is made in this report to develop methods to reduce stress due to radiation at higher than medically permissible dose rates. No special stress problems need be expected in any Air Force nuclear establishment, provided (a) that radiation levels are below the nationally established maximum permissible exposure rates, (b) that safety indoctrination of a realistic nature is provided personnel working in a radiation field, and (c) that a general orientation, emphasizing the precautions taken, is given to other personnel and dependents. In the case of personnel who must work in higher levels of radiation, it is not known whether they will show stress to a greater degree. It is likely that some small increase in the radiation level may be made without increasing stress to a major level. To date, research on stress offers little really firm guidance as to ways of reducing stress effects. The consensus of industrial opinion agrees with psychological opinion that stress and anxiety may be reduced by providing realistic orientation about the situation and training people for emergencies.
- 102 Tupes, E.C. Psychometric characteristics of Officer Effectiveness Reports of OCS graduates. February 1957. (AFPTRC-TN-57-20, ASTIA Document AD-098 923) (Project 7719, Task 17009). OER scores from 1949 through 1952 were obtained for 1400 male OCS graduates. These were analyzed by OCS class, by date of OER, and by length of time elapsing between graduation from OCS

and date of OER, with respect to their means, standard deviations, and reliabilities. Reliability was estimated both for a single report and an average of several reports. A dichotomous score conversion was developed. Except for a slight tendency for the mean OERs of recent OCS classes to be higher than those of earlier classes, there were no differences among means or standard deviations. There were slight tendencies for the reliabilities of OERs for more recent classes to be higher than those of earlier classes, and for OERs based on shorter lengths of time between OCS graduation and date of OER to be more reliable than OERs based on longer periods. None of the differences were large and it seems to make little difference with respect to predictability which OER is used as a criterion. The reliability of any single OER was so low (about .30) that an average score based on several OERs is necessary, either for research purposes or as the basis for decisions involving individual officers.

- 103 McMahon, C.A. & Associates. The "shortage" of scientific and engineering manpower in the United States. February 1957. (AFPTRC-TN-57-25, ASTIA Document AD-098 930) (Project 7722, Task 1710). This study surveys available information relevant to the so-called "shortage" of scientific and engineering manpower in an attempt to explain inconsistencies, point out gaps in the information, and provide guidance for planning purposes. Some 29 agencies outside the Air Force were identified as being concerned with the problem. Conferences were held with representatives of some of these agencies, and much data and many publications dealing with the subject were reviewed. The results indicate that no definitive evaluation of the general shortage of scientific and engineering manpower has been provided, nor is it likely that any can be provided with the information and analytical techniques at hand. This is due in part to conflicting assumptions and definitions employed, but primarily to the fact that no clear measure of manpower requirements on a national scale is in evidence.
- 104 Tomlinson, Helen & Schmid, J., Jr. Use of a difference-score criterion in item analysis. *J. educ. Res.*, 1957, 50, 373-381. February 1957. (AFPTRC-TN-57-27, ASTIA Document AD-098 932) (Project 7702, Task 77061). In constructing aptitude tests, methods are needed for selecting items that measure one trait and rejecting items that measure a different trait. The task selected was development of a new form of the General Mechanics test that would have a lower correlation with the verbal test, Word Knowledge. Data were available from a pool of 160 general mechanics items administered to 680 basic airmen. Criterion samples for item analysis were 172 airmen with a positive difference score and 184 airmen with a negative difference score. Items selected for the purified test were positively related to the difference-score criterion. Items selected for a control test correlated with the General Mechanics score, but not with the difference score. Experimental and reference tests were administered to an independent sample of 430 basic airmen. The purified form of the General Mechanics test consistently showed significantly lower correlations with the verbal reference test than those of the original test. In addition, the purified form had consistently higher correlations with the original General Mechanics test than the control form.
- 105 Humphreys, L.G. The normal curve and the attenuation paradox in test theory. *Psychol. Bull.*, 1956, 53, 472-476. March 1957. (AFPTRC-TN-57-29, ASTIA Document AD-098 934) (Project 7702). It has generally been assumed that to increase the reliability of a test is to increase its validity. Loevinger's 1954 paper argued that, with the usual assumption of continuous, normal test-score distributions, test validities decrease when reliabilities rise above a certain level. This paper challenges the appropriateness of the assumptions that lead to this so-called attenuation paradox. Hypothetical examples, statistical inference, and logical argument are used to demonstrate that the paradox is a consequence of the often unwarranted assumption of normality of both test scores and criterion distributions. With the simpler and more realistic assumption that distribution of psychological measurements are rank-order point distributions, the attenuation paradox is shown to be nonexistent.
- 106 Schmid, J., Jr., Morsh, J.E., & Detter, H.M. Analysis of job satisfaction. In *The thirteenth yearbook of the National Council on Measurements Used in Education*, 1956. Pp. 45-52. March 1957. (AFPTRC-TN-57-30, ASTIA Document AD-098 935) (Project 7950, Task 17078). This study attempts a meaningful substructuring of job satisfaction. A job-satisfaction scale of 60 Likert-type items was given to 238 airmen who were receiving on-the-job training at one Air Force base. Homogeneous keying was applied to derive 3 scales: (a) Sense of Personal Achievement; (b) Attitude

Toward Supervisors; and (c) Stress. Using items which appeared in one scale only as a basis for clusters, a bifactor analysis was performed. Both homogeneous keying and factor analysis showed that job satisfaction was not global, but structured. The scales produced by homogeneous keying were clarified by the factor analysis, but the same scales prevailed. One general factor was found in addition to the 3 group factors.

- 107 Austin, J.D. & Holloway, R.G. Operational feasibility tryout of the Experience Record, Form X-4. March 1957. (AFPTRC-TN-57-32, ASTIA Document AD-098 937) (Project 7700, Task 77015). The Experience Record was designed to be a device to select and classify technically qualified personnel. This study compares the Experience Record with other techniques. 4 groups of 1000 male basic airmen were the subjects. An 86-item hand-scored occupational inventory, the Experience Record, was administered to 2 of the 4 groups. The first group was given the Experience Record under paced testing conditions prior to the classification interview. The second group was given the Experience Record under non-paced testing conditions prior to the classification interview. The third group was given only a biographical questionnaire designed to give the interviewer a quick summary of the recruit's background and occupational preferences. The fourth group, the control group, was given only a standard classification interview. Time records and accuracy of identification showed that the Experience Record can be used effectively to locate numbers of technically qualified airmen (by-pass specialists) if the classification interview is not conducted.
- 108 Chorness, M.H. & Nottelmann, D.A. The prediction of creativity among Air Force civilian employees. March 1957. (AFPTRC-TN-57-36, ASTIA Document AD-126 366) (Project 7719, Task 17011). This study was designed to determine whether current tests of creativity were valid determiners of the same talent manifested in the Air Force Incentive Awards Program. 65 civilian employees identified as recipients of money awards took a battery of tests measuring creative thinking. The tests identify factorial dimensions of Ideational Fluency, Originality, Spontaneous Flexibility, Redefinition, and Sensitivity to Problems. The group also completed a questionnaire containing items about hobbies, family life, and classroom factors. 65 employees who had never submitted a suggestion were matched with the criterion group on intelligence, education, and performance rating. Neither the 5 creativity factor composites nor the 3 parts of the Personal Data Questionnaire differentiated the 2 groups significantly. All 5 creativity factors were significantly correlated with personal data items on hobbies and extracurricular activities representative of creative activities.
- 109 Wrigley, C., Cherry, C.N., Lee, Marilyn C., et al. Use of the square-root method to identify factors in the job performance of aircraft mechanics. Psychol. Monogr., 1957, 71, No. 1 (Whole No. 430). April 1957. (AFPTRC-TN-57-47, ASTIA Document AD-126 377) (Project 7700, Task 77016; Contract AF 33(038)25726, University of Illinois). This study was designed to identify some of the factors in the job performance of aircraft and engine mechanics. 200 items judged to be related to job performance were assembled and supervisors were asked to describe a "best," "poorest," or "average" mechanic of their own choosing in terms of responses to the items. A square-root factor analysis of correlations among items and the correlations between items and the "best-poorest" descriptions of mechanics identified items which supervisors consider most relevant to job proficiency. The 10 major factors were named: General Job Efficiency, Social Maladjustment, Executive Ability, Leadership, Personal Charm, Resourcefulness, Willingness and Adaptability, Orderliness, Ability to Motivate Others, and Mechanical Proficiency. Practical abilities were more necessary to success than general intellectual ability, and lack of motivation and a poor sense of responsibility are more detrimental than poor socio-emotional adjustment.
- 110 Tupes, E.C. & Christal, R.E. Psychological tests and the selection and classification of Air Force officers. April 1957. (AFPTRC-TN-57-52, ASTIA Document AD-126 383) (Project 7719, Task 17009). This report is a nontechnical review of research programs with a listing of 75 scientific publications produced by Air Force personnel research in this area. Contributions of psychological tests to officer selection for flying training and technical training are summarized. 5 graphic figures illustrate the efficiency of tests in selection. The directions in which current research is moving are indicated. Aptitude tests are generally used in officer selection programs but are not yet fully exploited in officer classification. As appropriate instruments are developed, wider use can be made

of aptitude tests in the classification of officers. Development of motivation and personality tests related to proficiency in specific job areas may increase precision of officer classification and add to the effectiveness of officer selection programs.

- 111 Krumboltz, J.D. Physical proficiency as a predictor of leadership. May 1957. (AFPTRC-TN-57-60, ASTIA Document AD-126 391) (Project 7719, Task 17009). To evaluate measures of physical proficiency against interim leadership criteria, 3 populations which are sources of Air Force officers were sampled: OCS cadets, aviation cadets in preflight training, and preflight student officers (AFROTC graduates). 7 tests of physical characteristics and proficiency were administered at the beginning of their training program: Height; Weight; Medicine Ball Throw; Pullups; Hurdle Run; Hop, Step, and Jump; and the 250-yard Shuttle Run. Leadership peer ratings were used as the criterion of leadership. Multiple correlations with the criterion were compared with a composite equally weighted with 5 physical proficiency tests (omitting height and weight). The tests proved reliable and had useful validity for predicting leadership ratings in the groups considered here. The multiple correlations range from .17 to .36. For aviation cadets and OCS cadets, the equally-weighted composite of 5 predictors yielded validities about equal to those obtained from use of all predictors optimally weighted. For student officers, the multiple regression technique gave higher validity.
- 112 French, Elizabeth G. Motivation as a variable in work-partner selection. *J. abnorm. soc. Psychol.*, 1956, 53, 96-99. May 1957. (AFPTRC-TN-57-63, ASTIA Document AD-126 394) (Project 7704, Task 77101). In many working or leadership situations individuals are faced with a choice between maximum performance and maximally pleasant personal relations. This study assessed the possibility of predicting the probability of choosing maximum performance. From data supplied by friendship ratings, 51 groups of 4 basic airmen were made up so that each group was composed of 3 mutual friends and one man the other 3 did not consider a friend. All took a test designed to measure relative strength of achievement and affiliation motivation. The members of each group worked individually on a task at which the nonfriend was permitted to succeed and the other 3 were made to fail. Then the airmen were asked to choose a partner to work on a similar task. The results showed that as the relative level of motivation shifted from high achievement-low affiliation to the reverse, the work-partner choices shifted from a single choice of the successful nonfriend through the choice of the success-person and the friend to the choice of both friends. Thus it is possible to determine which individuals have a high probability of making a performance-oriented rather than a friendship-oriented response in a conflict situation if relative strengths of achievement and affiliation motivation are known.
- 113 Merck, J.W. & McMahan, C.A. Estimates of failures of the Armed Forces Qualification Test, 1956. June 1957. (AFPTRC-TN-57-67, ASTIA Document AD-126 398) (Project 7722, Task 17101). The AFQT was designed to have the effect of eliminating the 10% of the total population in the registrant ages with the lowest aptitude. The purpose of this study was to estimate the rate of failure if the total male population in registrant ages took the AFQT. The estimated rate of failure was obtained by classifying the registrant population into homogeneous categories with respect to ability to pass the AFQT, establishing on an empirical basis the failure rate of each category; deriving from these data the total number of failures that might be expected; and finally estimating a single overall rate of failure. The results indicate that 10.9% of the total male registrant population would fail. Thus the established failure level falls within 1% of fulfilling its designed function.
- 114 Whitcomb, M.A. & Travers, R.M.W. A study of within-test learning functions as a determinant of total score. *Educ. psychol. Measmt.*, 1957, 17, 86-97. June 1957. (AFPTRC-TN 57-81, ASTIA Document AD-134 201) (Project 7703). This study presents 2 attempts to determine the presence of transfer of training from item to item in selected types of aptitude items. In experiment I, 4 test items for each of 3 kinds of aptitude test were administered in all 24 possible orders to 432 airmen. The items were scored for the number passing each item position. Item positions were intercorrelated to see whether adjacent items were more highly related than nonadjacent items. 2 of the 3 types of items showed learning, with the proportion passing increasing from .45 in position 1 to .58 in position 4. The third item type was easier than the others and showed no within-test learning effects. In experiment II, 21 items were presented as a test in which the first and last 5 items were arranged in

a Latin square design. The percentage of subjects passing each item continued to rise to the eighth item position, where it leveled off and then fell in the last segment of the test. Results of both studies demonstrate learning effects over the initial items of certain aptitude tests, but fail to demonstrate that this learning changes the function measured by the items.

- 115 Krumboltz, J.D. The relation of extracurricular participation to leadership criteria. *Personnel Guid. J.*, 1957, 35, 307-314. June 1957. (AFPTRC-TN-57-82, ASTIA Document AD-134 202) (Project 7701). Published studies were reviewed for what evidence exists that participation in high school and college activities is predictive of future success as a leader. No conclusive evidence exists that high-school extracurricular participation either has or has not a positive relationship to adult leadership. While a slight positive relationship is shown in some studies, the methodological faults preclude any conclusions. It is not known whether a person active in high school will tend to remain equally active in college. There is some evidence that college extracurricular participation is indicative of future leadership, although the extent of the relationship may depend on other factors such as the occupation of the group involved and the specific criterion used. These results suggest that high-school extracurricular participation should be used with extreme caution, as a selection instrument. College participation can be used with somewhat more confidence.
- 116 Harding, F.D., Jr. & McWilliams, J.T., Jr. Language aptitude tests as predictors of success in a six-month Russian course. June 1957. (AFPTRC-TN-57-86, ASTIA Document AD-134 204) (Project 7776, Task 67641). Because of high failure rates in some language courses, a 4-week trial course was set up as a screening device. As a possible cheaper alternative, language aptitude tests were evaluated to determine their effectiveness as selectors of trainees for a 6-month Russian course. Using a Language Aptitude Composite Score derived from 4 tests of the Psi Lambda Foreign Language Aptitude Battery, 2 classes were selected. From correlation of aptitude scores with course grades and comparison of attrition rates in classes selected by the 2 methods, it was found that the aptitude tests were as effective as the trial course in selecting trainees. Results of a cost analysis indicate that use of aptitude tests would reduce selection costs about \$850 per trainee selected.
- 117 Tupes, E.C. A proposal for an officer effectiveness selection battery based on measures obtainable during Basic and Advanced AFOTC. June 1957. (AFPTRC-TN-57-87, ASTIA Document AD-134 207) (Project 7719, Task 17009). The purpose of this report is to review possible officer effectiveness measures and to recommend a valid and feasible selection battery which would be useful in officer selection programs. Possible procedures were considered with respect to their validity for relevant criteria of officer effectiveness and to their feasibility (ease of administration and scoring, whether subject to coaching) for selection in the AFOTC program. An officer effectiveness selection battery is described which would be valid for the measurement of officer effectiveness and suitable for use in the AFOTC program and, with some modification, in other officer selection programs. It would consist of 5 procedures: (a) a standardized country-wide evaluation system based primarily on ratings by peers, cadet officers, and staff officers; (b) ratings by peers on a number of personality traits; (c) a comprehensive biographical-interest-personality inventory based on presently available items of demonstrated validity; (d) a physical proficiency test battery; and (e) a situational performance test series.
- 118 Fruchter, Dorothy Anne, Brokaw, L.D., & McReynolds, Jane. Effects of speed and difficulty level on the factorial content of spatial tests. June 1957. (AFPTRC-TN-57-89, ASTIA Document AD-134 232) (Project 7700, Task 77000; Contract AF 33(038)11046, University of Texas). This paper reports an investigation of the effect of speeding on the factorial content of spatial tests, the effect of item difficulty level on the factorial content of spatial tests, and the relative factorial content of Rights and Wrongs scores from speeded spatial tests. 9 tests, providing 15 scores, were given to 241 basic airmen. 5 of the tests (11 scores) were experimental spatial tests. The other 4 were standard Air Force reference tests. 2 of the spatial tests were unspeeded, 2 were speeded, and the fifth was administered part speeded and part power. A correlation matrix of the 15 scores was factor analyzed by the centroid method. Graphical orthogonal rotation produced 2 factors each specific to one test, and 3 others identified as Visualization, Spatial Relations, and Perceptual Speed. No general space factor appeared. Difficult items were no better measure of Visualization than were easy items. Wrongs scores load more heavily on Visualization, Rights on Perceptual Speed.

- 119 Whitcomb, M.A. Application of homogeneous keying to spatial relations items. July 1957. (AFPTRC-TN-57-91, ASTIA Document AD-134 211) (Project 7719, Task 17011). A homogeneous keying technique was applied to responses of 100 basic airmen to 180 test items selected to sample items used in spatial relations tests. The resultant tests were checked for stability of their reliabilities and intercorrelations on an independent sample of 500 airmen. The spatial relations tests developed, though not long enough to be immediately useful, can easily be lengthened. The method furnishes much the same information as factor analysis, but the product of the method is a set of independent tests ready for use. The pool of items selected for keying determines both the number and homogeneity of the tests produced. Therefore it is important to determine the range of item variety, to equalize the number of items of each type, and to limit the range of item difficulty so that the tests produced will be closely tailored to the proposed use.
- 120 Krumboltz, J.D. & Christal, R.E. Predictive validities for first-year criteria at the Air Force Academy. July 1957. (AFPTRC-TN-57-95, ASTIA Document AD-134 218) (Project 7719, Task 17009). The present study evaluates the effectiveness of a number of devices in terms of their ability to predict course grades and ratings available for Academy cadets at the end of their first year of training. The predictors were the 1955 Air Force Officer Qualifying Test (AFOQT) including all subtests and composite scores, several College Entrance Examination Board aptitude and achievement tests, a revised Activity Index, and other variables. Correlations of predictors with criteria and intercorrelations among the criteria are presented. The validities are generally high in spite of the considerable restriction due to selection and attrition. The Aptitude for Commissioned Service rating and course grades in philosophy are not well predicted. Additional tests measuring abilities, interests, and personality traits should be tried out in an effort to improve prediction in areas where validities are low.
- 121 Borg, W.R. The behavior of emergent and designated leaders in situational tests. *Sociometry*, 1957, 20, 95-104. July 1957. (AFPTRC-TN-57-101, ASTIA Document AD-134 222) (Project 7719, Task 17009). This paper reports observation of the emergence of leaders in initially leaderless groups and compares the efficiency of groups when individuals with varying degrees of leadership skill are designated as leaders. 41 teams, each of 6 men, were formed from OCS classes 55B and 55C. The test consists of 12 situational problems all requiring cooperation of team members and providing a situation in which sound leadership is important in successful solution. In the first 6 problems, no leader was designated. In the remaining 6 problems each member of the team was in turn designated leader. Observers marked on a checklist occurrence of defined types of leadership behavior. In the first 6 problems 3 types of teams were identified: 17 in which one leader clearly emerged; 14 in which no leader emerged; and 10 in which 2 competing leaders emerged. Results showed that selection of an effective leader stimulates problem-solving behavior among teammates rather than suppressing such behavior. Designation of an ineffective leader reduces the overall effectiveness of the team and suppresses emergence of an effective leader.
- 122 Kamenetzky, V. & Schmidt, H. Effects of personal and impersonal refutation of audience counterarguments on attitude change. *J. abnorm. soc. Psychol.*, 1957, 54, 200-203. July 1957. (AFPTRC-TN-57-102, ASTIA Document AD-134 223) (Project 7705, Task 77115; Contract AF 33(038) 25726, Task F, University of Illinois). 2 scripts on a controversial subject were prepared, identical except that one used the second-person pronoun in 27 places while the other used third-person nouns or pronouns. The counterarguments were against the side generally held by the subjects, 216 college men. 2 experimental treatments and 1 control treatment were administered. A pretest and posttest attitude questionnaire measured attitude change. The posttest included a questionnaire on reactions to the speech. Analysis of variance techniques were applied with classification by treatments and initial attitude levels. Personal refutation produced no greater attitude change or discounting tendencies than did impersonal refutation. Both experimental groups showed mean attitude changes that demonstrated persuasiveness of the counterarguments in either form. These findings suggest that the content of the refutation is more effective in influencing attitude change than the manner of presentation.

- 123 Thorndike, R.L. The optimum test composites to predict a set of criteria. July 1957. (AFPTRC-TN-57-103, ASTIA Document AD-134 224) (Project 7719, Task 17006; Contract AF 18(600)1208, Teachers College, Columbia University). A technique developed by Tucker was applied to the intercorrelations of the Airman Classification Battery and to validity coefficients for the tests in this battery for 46 training schools. The technique uses a series of matrix transformations, and yields a set of orthogonal composites of the original test scores such that the first composite accounts for the maximum amount of predictable criterion variance, and each following one accounts for the maximum amount of residual predictable criterion variance. Regression weights of the criterion variables on the first 8 composites were computed. The first 4 "principal composites" were then rotated in an attempt to achieve simple structure. Rotation of the first 4 principal composites in an attempt to achieve simple structure yielded 4 rather highly correlated composites. One related to verbal nontechnical jobs, one to high-level technical and engineering jobs, one to less intellectual mechanical jobs, and one to a group of unspecialized and nonintellectual jobs. The first principal composite accounted for as much overall criterion variance as either (a) the most valid of the 4 oblique composites or (b) the aptitude index used to classify airmen.
- 124 Morsh, J.E. The development of Air Force Factor Reference Battery II. July 1957. (AFPTRC-TN-57-104, ASTIA Document AD-134 225) (Project 7950, Task 17078). The purpose of this study was to determine the extent to which test characteristics of selected factor reference tests remain adequate after they have been shortened. On the basis of earlier research, 11 shortened tests were assembled, 10 of which were set up for machine scoring and one, Ideational Fluency, could be rapidly scored by hand. The Battery required one hour for administration. It was given twice to 222 basic airmen and 88 Recruiter School students, and once to 206 USAF Academy cadets. Test reliabilities, intercorrelations, and correlations with a large number of other tests were determined. The FRB II tests, despite their brevity, have satisfactory reliability. Several of the tests can be used to identify certain relatively pure factors.
- 125 Kelley, T.L. Development of an Activity Preference Test. July 1957. (AFPTRC-TN-57-107, ASTIA Document AD-134 228). (Project 7700; Contract AF 33(038)13632, Educational Research Corporation. Components of individual behavior are identified and measured through responses to a comprehensive questionnaire on activity preferences. The investigation follows up development and analysis of an Activity Preference Test with wartime Army samples by revising the test and verifying component scaling for airman samples. The test has 4 sections with alternate forms for all but the first section. The first section asks for biographical information as remembered at age 13½; the second section asks for activity preferences as remembered at age 13½; the third section asks for present preferences; and the fourth section asks for presumed preferences at age 45. It was revised to make it suitable for the airman age range and for both men and women. A chart form was developed for profiling individual and group component scores. Of the 15 components identified previously, 10 are retained which are bipolar in character so that both high positive and high negative scores may have meaning for differential prediction. Component scores derived from a simplified scoring method proved less reliable for most of the components than scores based on the original technique. The profile chart proved effective for showing individual deviations from group norms, and for identifying group patterns.
- 126 McQuitty, L.L. Isolating predictor patterns associated with major criterion patterns. Educ. psychol. Measmt., 1957, 17, 3-42. August 1957. (AFPTRC-TN-57-113, ASTIA Document AD-134 236) (Project 7700, Task 77016; Contract AF 33(038)25726, University of Illinois). A review was made of pattern-analytic methods for the analysis of unordered data in relation to the problem of isolating patterns of successful behavior. A method of pattern analysis was especially designed to yield additional light on the nature of the organization of successful behavior and applied to test data from 240 aircraft and engine mechanics. The predictive instruments included a self-descriptive inventory, a job-satisfaction inventory, and a job-knowledge test. The criterion was the Airman Performance Report, Form 75, consisting of 6 rating scales: Adjustment to Others, Technical Knowledge, Performance of Duties, Supervisory Ability, Overall Performance, and Qualifications for Promotion. The results support an earlier finding that responses to test items are organized into many patterns of behavior.



- 127 **Harding, F.D.** A survey of incentives for hazardous or unpleasant working conditions. August 1957. (AFPTRC-TN-57-115, ASTIA Document AD-134 240) (Project 7734, Task 17103). A survey of personnel practices within applicable industry and governmental agencies was made to ascertain the kinds of incentives used in motivating people to expose themselves to hazardous or unpleasant working conditions. At present, no base of systematic information exists on which to build a theory of incentives for hazardous or unpleasant work. Most incentives in use for this purpose have developed through supply and demand. Increased remuneration, company-bought work clothes, and paid cleanup time are the most common incentives used. Management generally does not favor the paying of such premiums, while labor's views are mixed. In the Armed Forces the practice of offering hazard pay for certain duty has become accepted. As such duty is voluntary, it appears that supply and demand has been the chief determinant. More information is needed about the nature of incentives for hazardous or unpleasant work before they can be applied with assurance of their effectiveness.
- 128 **Tupes, E.C.** Relationships between behavior trait ratings by peers and later officer performance of USAF Officer Candidate School graduates. October 1957. (AFPTRC-TN-57-125, ASTIA Document AD-134 257) (Project 7719, Task 17009). This study investigates the relationship between ratings of personality traits by peers in an officer training situation and later Officer Effectiveness Report (OER) ratings. For 790 candidates in 6 classes, ratings on 30 behavior traits were obtained on each member from every other member of his flight. 14 cluster scores were developed based on intercorrelations of the 30 traits. A multiple regression equation between the cluster scores and the effectiveness score served as the basis of a simplified trait composite score. A majority of the trait variables had substantial validity against the criterion. The multiple correlation with OERs was nearly equal to the reliability of the criterion. Class-by-class validities of the simplified composite varied considerably, but variations were unrelated to differences in rating conditions. The validities of the composite were as high as those for OCS military grades or academic grades. The valid personality traits reveal the high-rated officer as mature, well-adjusted, intelligent, assertive, well-motivated, socially poised, cooperative, and independent-minded.
- 129 **Flyer, E.S. & Carp, A.** Retention of rated AFROTC officers. October 1957. (AFPTRC-TN-57-126, ASTIA Document AD-134 258) (Project 7719, Task 17010). The purpose of this study was to identify factors associated with career attitudes among AFROTC pilot training graduates and to devise methods for increasing their retainability. Data were evaluated to determine differences between career and noncareer student pilots on performance in training, socio-economic and educational background, aptitude factors, and biographical inventories. 400 graduates of basic pilot training were interviewed about factors relevant to their decision concerning an Air Force career. The studies indicate that career interest is highly related to attitudes toward flying, attitudes toward military life, and job opportunities in civilian life. In the AFROTC population, individuals with high career potential could be identified as early as the sophomore year in college. Changes in the training program with respect to the "officer" role of the AFROTC graduate as a pilot trainee would increase the overall motivational level and career retention rate of the AFROTC graduate.
- 130 **Creager, J.A.** Discriminant analysis and its role in the classification of airmen. November 1957. (AFPTRC-TN-57-127, ASTIA Document AD-134 259) (Project 7719, Task 17008). The basic issues of discriminant analysis, methodology, and applications are reviewed critically from the viewpoint of potential application to the selection and classification of airmen. Relations among discriminant, regression, and allocation models are discussed. While the basic issues and methods of discriminant analysis are simple in principle, development leading to utility in airman assignment decision is complicated by effects of prior allocation. Further research should be concentrated on developing appropriate criteria for defining groups to be discriminated, and to clustering of jobs in terms of the ability of the classification battery to make discriminations.
- 131 **Woodworth, D.G. & MacKinnon, D.W.** The measurement of intellectual efficiency in an assessment of 100 Air Force captains. November 1957. (AFPTRC-TN-57-128, ASTIA Document AD-134 260) (Project 7730, Task 77353; Contract AF 18(600)8, Institute of Personality Assessment and Research, University of California, Berkeley). 17 measures of intellectual functioning obtained in an extensive psychological assessment of 100 Air Force captains were subjected to a factor analysis. 4 major factors emerged: functionally effective general intelligence, visual form-problem solving ability,

effectiveness and originality in complex problem solution, and overall general effectiveness. When factor scores were correlated with 11 criteria which were assumed to measure general officer effectiveness, it was found that the criteria of officer effectiveness were not predictable from the factor scores. Extreme caution should be exercised when using certain standard Air Force tools (e.g., Officer Effectiveness Reports) in evaluating the intellectual efficiency of officers because they may not be valid for this purpose.

- 132      **Woodworth, D.G., Barron, F., & MacKinnon, D.W.** An analysis of life history interviewer's ratings for 100 Air Force captains. November 1957. (AFPTRC-TN-57-129, ASTIA Document AD-146 401) (Project 7730, Task 77353; Contract AF 18(600)8, Institute of Personality Assessment and Research, University of California, Berkeley). As part of an assessment program of 100 captains, life history interviews were conducted and each captain was rated by his interviewer on 10 areas of personal development and adjustment. A centroid factor analysis was made of the inter-correlations among the 10 variables, identifying 4 factors: (I) drive for professional achievement; (II) stability of present adjustment; (III) personal scope and capacity for achievement; and (IV) character structure and mode of adjustment. Correlations of the resultant factor scores with measures of officer effectiveness showed that factors I and IV were good predictors of promotion board ratings.
- 133      **Gordon, Mary Agnes.** Interaction of experience and aptitude in predicting success in training courses for airplane and engine mechanics. November 1957. (AFPTRC-TN-57-133, ASTIA Document AD-146 406) (Project 7719, Task 17008). Previous studies have shown that aptitude tests predict training grades differently for men and women and for men from different regions. The studies reported explore regional differences in background, the influence of background factors on the prediction of mechanical training grades, and the effect of different backgrounds at various stages in training. Differences in background may be measured either by biographical information or by the difference between comprehension and information scores on mechanical aptitude tests. It was found that mechanical experience was correlated more with mechanical aptitude than with final school grades. It was demonstrated that a biographical measure of mechanical experience could be used to correct mechanical aptitude scores and thus improve the prediction of grades. Previous mechanical experience was a greater advantage in the final than in the initial phase of training. In using a mechanical aptitude composite to predict success in training, some correction for differences in previous experience should be considered.
- 134      **Judy, C.J. & Adair, J.G.** A comparison of two groups of mechanics on specific maintenance knowledge. December 1957. (AFPTRC-TN-57-139, ASTIA Document AD-146 413) (Project 7950, Task 17075). 2 questions were asked with respect to 8 areas of knowledge covering the maintenance of an important new weapon system: (a) Is there a difference in test performance of field trained mechanics as compared with technical-school trained mechanics? (b) Is there a difference at particular levels of mechanical aptitude and maintenance experience in the test performance of these 2 groups of mechanics? For none of the knowledge areas was there a statistically significant difference in favor of either group. But at particular levels of mechanical aptitude and maintenance experience, regions of significance were identified where one group was distinctly superior. Except for 2 knowledge areas, field training seemed generally best for high-aptitude, high-experience mechanics; technical-school training seemed generally best for low-aptitude, low-experience mechanics.
- 135      **Tupes, E.C., Carp, A., & Borg, W.R.** Validation of a proposed officer effectiveness selection battery. December 1957. (AFPTRC-TN-57-141, ASTIA Document AD-146 415) (Project 7719, Task 17009). Selection procedures now in use in the various officer programs are designed to insure that accepted candidates have the needed aptitudes to profit from officer technical training courses; but no systematic selection is being made with respect to officer effectiveness potential. Procedures designed to predict officer effectiveness were administered to 2 OCS classes at the start of training and validated against performance in training and against an intermediate criterion of officer effectiveness. 14 of the 22 measures studied were significantly valid for prediction of the intermediate criterion. A composite based on the unit-weighted combination of these measures would increase the efficiency of present selection procedures and could probably contribute to the selection efficiency in other officer programs.

- 136 Gordon, Mary Agnes. Patterns of mechanical background and aptitude. *Educ. psychol. Measmt.*, 1957, 17, 408-415 November 1957. (AFPTRC-TN-57-137, ASTIA Document AD-145 411) (Project 7719, Task 17008). To determine the influence of background factors and tested mechanical aptitude on success in mechanical training, 577 graduates of an Airplane and Engines Mechanics course were categorized into 16 groups according to their high or low status on each factor. Status on the background factors (opportunity for gaining mechanical information, preference for mechanical activities, urban or rural background, and mechanical experience) was determined by responses on a self-report questionnaire (biographical inventory). Patterns were compared by differences in percentage above the median course grade in training. Results showed that mechanical background contributes to training success mainly through selection for training on the basis of mechanical information scores and that excess of experience over information reduces chances of success.
- 137 McQuitty, L.L. A pattern analysis of descriptions of "best" and "poorest" mechanics compared with factor-analytic results. *Psychol. Monogr.*, 1957, 71, No. 17 (Whole No. 446). December 1957. (AFPTRC-TN-57-155, ASTIA Document AD-152 119) (Project 7700, Task 77016; Contract AF 33(038)25726, University of Illinois). A kind of pattern analysis, agreement analysis, is developed and applied to rated characteristics of Air Force mechanics selected as best and poorest by their supervisors. Results identify several, rather than a single, types of best and poorest mechanics. Results of a factor analysis are compared with those of the agreement analysis, showing the complementary nature of information from both kinds of analysis.
- 138 Brokaw, L.D. & Burgess, G.G. Development of Airman Classification Battery AC-2A. June 1957. (AFPTRC-TR-57-1, ASTIA Document AD-131 422) (Project 7700, Task 77008). An aptitude test battery has been used in counseling and assigning airman recruits since 1948. New forms are introduced as changes in Air Force requirements and advances in testing procedures permit major improvements. The form adopted by the Air Force in January 1956 provided 14 test scores differentially combined in 5 aptitude indexes: Mechanical, Administrative, Radio Operator, General, and Electronics. From a standardization administration to 2000 airmen, scores were converted to a 20-interval centile scale. Reliabilities proved equal to the previous battery and intercorrelations among aptitude indexes were considerably reduced, thus improving accuracy of classification.
- 139 Thorndike, R.L. & Hagen, Elizabeth P. Attitudes, educational programs, and job experiences of airmen who did not reenlist. June 1957. (AFPTRC-TR-57-2, ASTIA Document AD-134 209) (Project 7719, Task 17010; Contract AF 18(600)1359, Teachers College, Columbia University). A survey by interview or questionnaire of 750 one-term former airmen representing 7 career fields was designed to identify reasons for nonreenlistment. Analyses of responses showed that men interested in reenlistment are likely to be in low priority career fields, to be uninterested in continuing their education, to have low aptitude indexes, and to receive low pay on their civilian jobs. Over 50% of the men were continuing their education and 25% were in jobs related to their Air Force specialty. Income averaged a little higher than Air Force pay, excluding retirement benefits, but less when all benefits are included.
- 140 Eilbert, L. R., Glaser, R., & Hanes, R.M. Research on the feasibility of selection of personnel for duty at isolated stations. With Appendix, Annotated bibliography of research on personnel problems associated with Arctic duty, by L.R. Eilbert & R. Glaser. July 1957. (AFPTRC-TR-57-4, ASTIA Document AD-134 241) (Project 7776, Task 67612; Contract AF 41(657)74, American Institute for Research). Objectives were to identify variables that might be useful in selecting men for assignment to isolated Arctic bases. 648 men were tested and interviewed at 8 Arctic bases. Supervisors' nominations of well adjusted and poorly adjusted men identified 2 criterion groups. Variables which differentiated the criterion groups were personality and background characteristics that may be of long standing and unrelated to the conditions of Arctic isolation. Hence a man's history of adjustment may be the best predictor of adjustment to an isolated Arctic environment.

- 141 Thorndike, R.L., Hagen, Elizabeth P., Orr, D.B., et al. An empirical approach to the determination of Air Force job families. August 1957. (AFPTRC-TR-57-5, ASTIA Document AD-134 239) (Project 7719, Task 17008; Contract AF 18(600)1208, Teachers College, Columbia University). This study tries out a technique for assessing job requirements and for grouping jobs into homogeneous job families. A job activities questionnaire, with the items designed to be "pure" measures of a single job aspect, was filled out by airmen representing 25 AFSCs. From responses, a profile of job requirements was determined for each AFSC. By computing "distances" between each pair of profiles, job clusters were defined by grouping together AFSCs with the least distance between profiles of job requirements. Scores for the different aspects showed substantial correlation, and the definitions of job clusters proved not very informative, but the technique clearly separated mechanical from nonmechanical jobs, and supervisory from nonsupervisory jobs. This technique is not likely to prove useful unless more and better items are developed for the scales of job requirements.
- 142 Matthews, J. & Lupfer, B. Development of tests to measure nonintellectual aspects of officer aptitude. August 1957. (AFPTRC-TR-57-6, ASTIA Document AD-134 243) (Project 7701; Contract AF 33(038)10587, American Institute for Research). From inventories of critical officer behaviors, 36 nonintellectual behaviors were identified. These were grouped into 4 areas for each of which sets of test questions were constructed. A Criterion Report Sheet was devised for collection of criterion data. Officer Candidate School classes provided test and criterion data for validation analyses. There was no evidence that the Criterion Report Sheets discriminated between the 4 behavior areas, since intercorrelations were about as high as reliability estimates. Correlations of the tests with corresponding criterion measures were no higher than with the ratings in other behavior areas. The new tests showed no practical relationship with any of the various criteria. The basic problem in measuring nonintellectual aptitudes remains the development of a useful, predictable criterion.
- 143 Combs, J.W., Jr. Estimates of the male population, 18-29 years old, by states, 1960. November 1957. (AFPTRC-TR-57-10, ASTIA Document AD-146 402) (Project 7736, Task 17048). Air Force Recruiting effort requires information concerning the geographic distribution of potential Air Force recruits. The method used was a variant of extrapolation from observed trends adaptable to electronic computers. Data were observed population changes by single years of age between 1940 and 1950 and estimated changes by broad age groups between 1950 and 1955 upon the basis of which probable changes over the period 1955-1960 were determined. On the basis of the projections, about one-fourth of the states can be expected to gain or lose less than 5% of their male populations, ages 18-29, during the decade 1950-1960. Gains greater than 5% may be expected in 14 states, and losses greater than 5% are anticipated in 20 states and the District of Columbia.
- 144 Torrance, E.P., Rush, C.H., Jr., Kohn, H.B., et al. Factors in fighter-interceptor pilot combat effectiveness. November 1957. (AFPTRC-TR-57-11, ASTIA Document AD-146 407) (Project 7680, Task 76803). Officially recorded data on 749 F-86 pilots with combat tours in Korea were analyzed for differences in background and personal data. Then 31 aces were matched with 31 nonaces for rank, age, and World War II experience and compared on variables derived from interviews, questionnaires, and Rorschachs. Rank, age, time in service, and flying time were all positively related to claim scores, but aptitude test scores were not. 5 scales derived from a Life Experience Inventory and 3 Rorschach scores differentiated aces from nonaces. Aces tried harder than nonaces for combat assignments.
- 145 Fitzpatrick, R. & Cullen, J.W. Prediction of airman reenlistment. December 1957. (AFPTRC-TR-57-12, ASTIA Document AD-146 416) (Project 7719, Task 17010; Contract AF 41(657)12, American Institute for Research). From interviews with 169 airmen near the end of their first Air Force tour, it was found that those reenlisting were likely to differ from nonreenlistees in family and social background and in attitudes toward the Air Force. Information from the interviews was used to assemble a variety of personal history, interest, and attitude inventories which were given to 448 airmen representing 3 career fields: Electronics, Mechanical, and Supply. Multiple correlations to predict reenlistment ranged from .69 to .71 for the 3 career fields, but the characteristics entering into the equations differed. A composite to predict reenlistment would have to take into account the career field for which the man qualifies.

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- 146 Crutchfield, R.S., Woodworth, D.G., & Albrecht, R.E. Perceptual performance and the effective person. April 1958. (WADC-TN-58-60, ASTIA Document AD-151 039) (Project 7730, Task 77353; Contract AF 18(600)8, Institute of Personality Assessment and Research, University of California, Berkeley) (OTS). This study presents data collected from 10 perceptual tests included in an extensive psychological assessment of 100 Air Force captains. The purpose of this report is to show the potential contribution of such perceptual behavior to the assessment and understanding of personality. Stress is upon the perceptual performance of the military officer rated effective. Results indicate that the perceptual tests are most strongly related to the areas of intellect and cognitive flexibility. Numerous significant relationships were found with tests in the areas of emotional adjustment, social relations, and leadership. The specific nature and direction of the relationships between perceptual and personality measures are consistent with the assumption that basic personality trends are general in nature and should manifest themselves in analogous ways in perceptual and other forms of behavior.
- 147 Tupes, E.C. & Christal, R.E. Stability of personality trait rating factors obtained under diverse conditions. May 1958. (WADC-TN-58-61, ASTIA Document AD-151 041) (Project 7719, Task 17109) (OTS). (Superseded by Tupes, E.C. & Christal, R.E. Recurrent personality factors based on trait ratings. May 1961 (ASD-TR-61-97, ASTIA Document AD-267 778). Peer ratings by officer candidates on specific personality traits have been shown to be predictive of later officer performance. The present study investigated personality trait ratings to determine their factorial structure and the extent to which the factors remained constant in spite of differences in samples, raters, lengths of acquaintanceship, and rating situation. 6 intercorrelation matrices were factored and the resulting factors rotated to orthogonal simple structure. 5 clearly defined personality factors were found in each analysis which remained relatively invariant through all analyses, identified as Surgency, Agreeableness, Dependability, Emotional Stability, and Culture. The factor structure of personality trait ratings is sufficiently invariant that such trait ratings may be regarded as adequate criteria for the study of personality differences and for test development purposes.
- 148 Flyer, E.S. A follow-up study of Naval Academy graduates who entered the Air Force. June 1958. (WADC-TN-58-62, ASTIA Document AD-151 042) (Project 7719, Task 17115) (OTS). Air Force Academy selection and proficiency records cannot be validated against measures of officer effectiveness for some years, but an estimate of the relationship of training grades to officer performance can be obtained from comparable records of Naval Academy graduates who have entered the Air Force. In this study, midshipman training grades were related to Air Force retainability and to officer effectiveness measures. The retention rate in the Air Force of Annapolis graduates, 5 to 8 years after graduation, is about 73%. Graduates who resigned their commissions had lower Physical Training grades than those officers remaining on active duty, but differed in no other training proficiency measures. Naval Academy grades predict officer effectiveness reasonably well, with Aptitude-for-Service ratings proving the best single predictor of Air Force officer effectiveness. These results support the use of Aptitude-for-Service ratings and academic grades received at the Air Force Academy as intermediate criteria of officer effectiveness.
- 149 McReynolds, Jane. Aptitude levels in the enlisted manpower pool of the Air Force. September 1958. (Part I, WADC-TN-58-63(I), ASTIA Document AD-151 047; Part II, Appendix, WADC-TN-58-63(II), ASTIA Document AD-151 048) (Project 7719, Task 17106) (OTS). Rapid development of weapon systems has increased the need for highly qualified airmen in technical areas and for information concerning their availability. This is the first in a series of reports designed to provide estimates of the aptitude levels of enlisted personnel in the Air Force. From data collected in the May 1957 Sample Survey, distributions of aptitudes were obtained by career fields, by reenlistment plans, by term of enlistment, by skill level, and by grade. Distributions are presented in terms of the total Air Force enlisted population so that estimates can be made not only of the numbers of airmen at each aptitude level in any one group, but of the numbers in any other group who have aptitude levels high enough to permit efficient retraining into shortage areas. For airmen in their first term of

enlistment, aptitude distributions were typically the normal bell shape with little difference in level between career fields. Airmen in later enlistments were typically higher in aptitude; methods of screening for reenlistment and for promotion build up the quality of career personnel so that the majority of NCOs, and especially those in the highly technical career fields, have high aptitude qualifications and are capable of supporting modern technological advances.

- 150      Woodworth, D.G. & MacKinnon, D.W. The use of trait ratings in an assessment of 100 Air Force captains. September 1958. (WADC-TN-58-64, ASTIA Document AD-202 845) (Project 7730, Task 77353; Contract AF 18(600)8, Institute of Personality Assessment and Research, University of California, Berkeley) (OTS). As part of a project for developing officer assessment techniques, 30 rating dimensions were used by 10 raters to record their psychological evaluations of 100 captains. A cluster analysis of these ratings yielded 3 reliable cluster scores defined as measuring general effective intelligence, personal soundness and assessability, and effective leadership. The cluster scores did not correlate significantly with available Air Force criterion evaluations of the subjects. When the officers were differentiated on the basis of being rated or nonrated, the correlations between cluster scores and 2 of the criteria rose to levels which were significant within the rated group. This suggests that differentiation on the criterion side of the relationship is needed for significant advancement toward an understanding of the Air Force officer personnel evaluation variables, or the relating of psychologically meaningful measures to these criteria.
- 151      Thompson, C.A. Aptitude differences related to region of enlistment of basic airmen. September 1958. (WADC-TN-58-65, ASTIA Document AD-202 846) (Project 7719, Task 17104) (OTS). Regional differences in mean performance on aptitude variables were found with basic airmen samples tested in 1950 and 1953. This study examines trends in overall regional differences for a 1957 sample of 4500 basic airmen. Regional differences on specific variables are examined in terms of AFQT mental category. Geographical regions are Army areas of enlistment and the territories. The variables are the Armed Forces Qualification Test, the 5 Airman Classification Battery Aptitude Indexes (AC-2A), and the individual tests of the Airman Classification Battery. Major regional differences in mean performance were consistent with regional differences reported for 1950 and 1953 samples. Low aptitude airmen made the principal contribution to overall regional differences on specific aptitude variables. High aptitude airmen tended to exhibit only slight differences in mean performance by geographical region. The territorial sample's performance was atypical of the performance of continental samples.
- 152      Ewart, E.S. A survey of potential morale, motivation, and retention problems at ballistic missile sites. October 1958. (WADC-TN-58-66, ASTIA Document AD-203 399) (Project 7719, Task 17119) (OTS). Potential morale, motivation, and retention problems among personnel at ballistic missile complexes are reviewed, together with pertinent research findings in the military and industrial literature. Although morale and motivation problems do not appear particularly unique, there are important considerations of emphasis. Therefore problem areas and proposed solutions are viewed in the broad context of analogous conditions in other military and industrial situations. This provides a framework for more effective evaluation of personnel actions. It is a major thesis of this report that in the area of improved management and leadership practices lies the greatest potential for enhancing morale and motivation to get things done effectively at ICBM complexes.
- 153      Thompson, C.A. The relation of selective aptitude index to performance in technical school. November 1958. (WADC-TN-58-67, ASTIA Document AD-205 365) (Project 7719, Task 17104) (OTS). The effectiveness of the Airman Classification Battery (Form AC-2A) in predicting success in airman technical school courses is examined. The population consisted of airmen enlisted during the first 3 months of 1956 and assigned to 10 groups of technical schools after basic training. The relationships of the aptitude index used for selection with final school grades are depicted in 11 charts. The selective aptitude index was predictive of class standing in all courses, the strongest relationships obtaining for the highly technical courses. During this period a majority of the airmen assigned to the highly technical courses did not meet the selective aptitude index minimums recommended by the Air Force.

- 154 Tupea, E.C. & DuBois, D.B. The educational achievement of Air Force officers. November 1958. (WADC-TN-58-68, ASTIA Document AD-205 546) (Project 7719, Task 17109) (OTS). Do years of formal education truly measure an Air Force officer's educational achievement? Do many officers have more knowledge than would be expected from the number of years they spent in school? To answer these questions, 1300 student officers at Air University were given the Area tests and an Advanced test of the Graduate Record Examination. Results indicate that years of education is not very predictive of actual educational achievement and usually underestimates it. As a group, officers were found to have learned more than would be expected from their years of education. Although only 40% of the officers had college degrees, between 50% and 60% scored as high on the Area tests as satisfactory college graduates. On the Advanced tests, which measure intensive knowledge in specialized academic major fields, the officers compared favorably with first-year graduate students. Many officers who lacked the educational requirements for Air Force training courses had as much of the specialized knowledge needed for enrollment in such courses as did officers with the prerequisite educational backgrounds. Were entrance requirements for these courses altered to permit qualification on a test basis, the number of officers eligible for such training would be greatly increased.
- 155 Valentine, L.D., Jr. Validity of the AFOQT (Form A) for prediction of student-officer success in observer training. December 1958. (WADC-TN-58-69, ASTIA Document AD-207 334) (Project 7717, Task 87006) (OTS). The Air Force Officer Qualifying Test, Form A, was administered to AFROTC sophomores. During the latter half of 1957 criterion data matured on those examinees who had entered Observer Training after completion of the AFROTC program. The aptitude composites and subtests of the AFOQT were validated against 3 criteria of success in Observer Training. It was found that the Observer-Technical composite is a valid predictor of success in Observer Training for this population. This Note reports the first Observer validities to become available for an AFROTC population.
- 156 Carp, Frances M. Relationships between airman interests and career satisfaction. March 1958. (WADC-TR-58-90, ASTIA Document AD-151 038) (Project 7719, Task 17008; Contract AF 41(657)60, Trinity University). This study is an attempt to validate a 264-item interest inventory for inclusion in the basic airman battery to improve prediction of general competence in the Air Force situation and in particular Air Force jobs. Assuming that satisfaction is related to effectiveness in a work situation, it was taken as the criterion for this study. Responses of 842 airmen were validated against their answers to Sample Survey questions selected as indexes of satisfaction with the general Air Force situation and with particular Air Force duty. Predictive validity was not demonstrated for existing keys with general Air Force personnel or selected job specialty groups; item analysis did not result in new scales.
- 157 MacKinnon, D.W., Crutchfield, P.S., Barros, F., et al. An assessment study of Air Force officers: Part I. Design of the study and description of the variables. April 1958. (WADC-TR-58-91(I), ASTIA Document AD-151 040) (Project 7730, Task 77353; Contract AF 18(600)8, Institute of Personality Assessment and Research, University of California, Berkeley) (OTS). This is the first part of 5-part report covering an extensive psychological assessment of a group of Air Force captains selected from the population of captains within Air Training Command who were eligible for promotion. The 343 captains participating in the field-testing phase of the assessment were given 27 paper-and-pencil tests. From the field-testing sample, 100 officers were assigned, in groups of 10, to a 3-day living-in phase of the assessment. During this period they entered into some 50 assessment procedures, and a staff of psychologists rated each officer on a wide variety of personality variables considered relevant for effectiveness in senior command and staff assignments. Effectiveness measures were obtained as criteria from Officer Effectiveness Reports, promotion board ratings, and superiors' ratings. This report presents the overall design of the study and defines each of the 648 variables. Norms are listed in an appendix. The report is considered a reference document for use with the other 4 parts of the Technical Report.
- 158 Gough, H.G. & Krauss, I. An assessment study of Air Force officers: Part II. Description of the assessed sample. September 1958. (WADC-TR-58-91(II), ASTIA Document AD-208 700) (Project 7730, Task 77353; Contract AF 18(600)8, Institute of Personality Assessment and Research, University of California, Berkeley) (OTS). This is the second part of a 5-part report covering an

extensive psychological assessment of a group of Air Force captains. It presents sociological and psychological descriptions of the sample of 343 captains participating in the field-testing phase of the assessment. The typical member may be characterized as being a reserve officer who entered the service during World War II as an enlisted man and who received his commission through flying school. He is eligible for promotion to the grade of major. He is married and desires an Air Force career. His intelligence score is above the mean for the general adult population, but below the level defined as superior. His personal adjustment and psychiatric stability are judged to be excellent. In social technique he is characterized by factors of leadership and dominance, capacity for status, and achievement motivation. Tests of social acuity and social insight place him in an average rank among groups of equivalent education or occupational status. His vocational interest profile is basically a "military officer" profile similar to the pattern observed in other studies.

- 159 Barron, F., Block, J., MacKinnon, D.W., et al. An assessment study of Air Force officers: Part III. Assessment correlates of criteria of officer effectiveness. December 1958. (WADC-TR-58-91(III), ASTIA Document AD-210 218) (Project 7730, Task 77353; Contract AF 18(600)8, Institute of Personality Assessment and Research, University of California, Berkeley) (OTS). This is the third part of a 5-part report covering an extensive psychological assessment of a group of Air Force captains. Criterion data were gathered from Promotion Board Ratings, Officer Effectiveness Reports, superior officers' ratings, and from structured interviews with the officers. Overlap in criteria was reduced by factor analysis. Separate sections deal with predictability of criteria from 3 different sources. Officers rating high on each criterion are described in terms of assessment variable correlates.
- 160 Gough, H.G. An assessment study of Air Force officers: Part IV. Predictability of a composite criterion of officer effectiveness. December 1958. (WADC-TR-58-91(IV), ASTIA Document AD-210 219) (Project 7730, Task 77353; Contract AF 18(600)8, University of California, Berkeley) (OTS). This is the fourth volume of a 5-part report of a project to develop methods for identifying Air Force officers with high potential for effective military leadership. Its purpose is to reduce the data for 11 criteria to a practical composite criterion and to organize data concerning 631 test and assessment variables for prediction of the composite criterion. Evaluation of the criteria led to selection of 3 for combination in a Criterion Index. From correlations of the predictor variables with this criterion, 41 were identified that maintained significant relationships. By cluster analyses, these were reduced to homogeneous composite predictors that could be defined as psychological dimensions of officer effectiveness. By item analysis, lists of adjectives differentiating high-scoring from low-scoring officers on the Criterion Index were made, and extensive personality questionnaire data were reduced to 2 brief scales keyed to predict the Criterion Index. The results identify both the group-testing instruments and individual assessment devices that hold promise for identification, early in an officer's career, of those capable of becoming outstanding commanders.
- 161 MacKinnon, D.W. An assessment study of Air Force officers: Part V. Summary and applications. December 1958. (WADC-TR-58-91(V), ASTIA Document AD-210 220) (Project 7730, Task 77353; Contract AF 18(600)8, Institute of Personality Assessment and Research, University of California, Berkeley) (OTS). This is the final volume of a 5-part report, summarizing results of a project to develop methods for identifying Air Force officers with high potential for effective military leadership. It surveys significant relationships between predictor and criterion variables. Inferences from these relationships provide a comparative evaluation of the criteria of officer effectiveness and lead to selection from the experimental devices of instruments proposed for inclusion in a program of officer assessment.
- 162 Taylor, C.W., Smith, W.R., Ghiselin, B., et al. Identification of communication abilities in military situations. June 1958. (WADC-TR-58-92, ASTIA Document AD-151 043) (Project 7719, Task 17053; Contract AF 18(600)1211, University of Utah) (OTS). This research was designed to define the dimensions of communication abilities, to provide techniques for measuring performance in communication in military situations, and to determine test predictors of the communication abilities thus defined and measured. A list of communication requirements was abstracted from descriptions of airman jobs. Tests were assembled assumed to be predictive of these abilities. From their administration in 2 large test batteries to samples of airmen the data were analyzed for selection of predictors, to include with criterion variables in a validation battery. 18 situations tests provided



27 criteria of communication effectiveness. Significant relationships between predictors and criteria demonstrated the practicability of assembling either a general set of predictors or groups of specific predictors. There is evidence that communication abilities are more complex than the categorization by communication channel (speaking, writing, reading, listening) implies; integrating abilities are predictive of effectiveness in all channels.

- 163 Thompson, C.A. Development of the Airman Qualifying Examination, Forms D and E. August 1958. (Part I, WADC-TR-58-94(I), ASTIA Document AD-151 045; Part II, Appendix, WADC-TR-58-94(II), ASTIA Document AD-151 046) (Project 7717, Task 87005). Forms D and E of the Airman Qualifying Examination were developed for field use in obtaining a set of aptitude indexes equivalent to indexes of the Airman Classification Battery. They were designed for administration at a single testing session and for hand scoring. 4 aptitude indexes are obtained: Mechanical, Administrative, General, and Electronics. The item types used in the AQE indexes conform generally to those of the Airman Classification Battery, AC-2A. Each AQE index is standardized on the corresponding AC-2A index and uses the same form of converted index, a 20-step percentile scale. The 2 batteries are substantially equivalent except that when AQE is administered before the ACB, AQE scores tend to be lower. The practical importance of this difference will vary with the use of the instruments.
- 164 Glanzer, M. & Glaser, R. A study of non-intellectual correlates of trouble-shooting ability: Rigidity measures. October 1958. (WADC-TR-58-488, ASTIA Document AD-204 511) (Project 7719, Task 17011; Contract AF 41(657)58, American Institute for Research) (OTS). The main objective of this study was to determine the relationship between measures of problem-solving rigidity and performance on both novel and routine troubleshooting tasks concerned with electronics equipment. 13 rigidity tests were constructed in 4 categories; ability to change performance sets; ability to change perceptual sets; preference for highly structured, simple stimuli; and general attitudes. Alternate sets of criterion problems each included 3 routine and 3 novel trouble-shooting problems. The hypothesis to be tested was that scores on the tests of the rigidity battery would be significantly related to performance on the novel problems, but not on the routine problems. Results from administration to airman trainees showed equally low relationships between the rigidity measures and both criterion measures. Combinations of the Electronics Aptitude Index with selected rigidity test scores showed only slightly improved prediction of training school performance, over the aptitude score alone.
- 165 Thorndike, R.L. & Hagen, Elizabeth P. Long-term prediction of some officer-effectiveness measures from aptitude tests. October 1958. (WADC-TR-58-489, ASTIA Document AD-204 531) (Project 7719, Task 17109; Contract AF 41(657)10, Teachers College, Columbia University) (OTS). Aptitude tests administered to applicants for flying training in 1943 were correlated with selected indicators of achievement during the following 12 years for 873 Air Force officers. Criterion components identified were: (1) effectiveness as perceived by superiors; (2) quality and quantity of flying duty; (3) importance of duty assignments; and (4) continuity of service. The first component was predicted, but only to a slight degree, by tests of intellectual and academic ability. Tests of mechanical ability and of motor coordination were slightly predictive of the second and third components. The fourth component was largely unpredicted. Any success in identifying men who would receive high officer effectiveness ratings came from measures of quantitative and intellectual abilities and not from the tests that predict success in flying training.
- 166 Krumm, R.L. & Newman, P.H. Accuracy of information on line work orders for armament-electronics maintenance. December 1958. (WADC-TR-58-490, ASTIA Document AD-207 335) (Project 7950, Task 17077; Contract AF 41(657)119, American Institute for Research). 10 weeks were spent at 2 Armament-Electronics squadrons observing time spent by mechanics in performing 76 typical steps of a troubleshooting job. Comparison of actual time worked with time reported by the mechanic on Line Work Orders (Form 322) indicated that (a) errors in reporting time worked are largest for shorter jobs and for jobs requiring a time greater than 4 hours per man, (b) depending on the number of men available for assignment, squadrons may differ significantly in the number of man-hours spent on each job even though the jobs are of the same difficulty; and, (c) there is a marked consistency in the amount of time spent on subtasks of a troubleshooting job which are necessary, but which are not "troubleshooting" per se. It was concluded that the Form 322 as presently used does not constitute a usable source of criterion information regarding Armament-Electronics mechanics' troubleshooting proficiency.

- 167 Warrington, W.G. & Saupe, J.L. Spatial abilities and selected elements of Air Force technical jobs. December 1958. (WADC-TR-58-491, ASTIA Document AD-207 336) (Project 7719, Task 17108; Contract AF 41(657)132, Michigan State University) (OTS). This study is an attempt to validate an Air Force spatial survey test and to determine whether this test can contribute additional spatial factors to the Airman Classification Battery. A 3-dimensional performance-type criterion was developed that simulated perceptual elements identified in 26 selected Air Force technical specialties. The criterion measure, the Space Survey Test, a measure of general mental ability, and a measure of mechanical experience and interest were administered to 273 high school junior boys. Analyses of these data indicate that the Space Survey Test has considerable power for predicting the criterion, independent of the measures of mental ability and mechanical experience. The multi-score Space Survey Test is only slightly more effective in predicting the criterion than one of the sub-scores.
- 168 Aronson, E. & Festinger, L. Some attempts to measure tolerance for dissonance. December 1958. (WADC-TR-58-492, ASTIA Document AD-207 337) (Project 7732; Contract AF 41(657)140, Stanford University) (OTS). Individuals differ in their ability to tolerate cognitive dissonance introduced in laboratory experiments. The research reported in this paper was an attempt to develop a measure of tolerance for dissonance. 5 tests were developed, 4 of which were administered to the predetermined criterion groups. None of these discriminated between subjects whose behavior indicated a high tolerance for dissonance from those whose behavior indicated low tolerance for dissonance. A different approach to a criterion was tried by identifying a group that had demonstrated high tolerance in a real-life situation. These were students who had changed majors in their junior year of college. A personality inventory was constructed and administered to ex-engineering majors and to a control group of engineering majors. Substantial differences in responses appeared in 6 areas. The general effectiveness of the questionnaire as a measure of tolerance for dissonance must be tested by administration to other groups that have recently made an important life decision, such as changing occupation or religion.
- 169 Brokaw, L.D. Some statistical methods for detection of nonstandard test administration. January 1959. (WADC-TN-59-34, ASTIA Document AD-210 475) (Project 7719, Task 17106) (OTS). Fallacious test scores may appear from such sources as cheating, improper procedures of test administration, or errors of scoring. 3 techniques appropriate to detection of abnormalities of score distributions occasioned by the shifting of a group of scores from its proper place within the distribution are the sign test, the Kolmogorov-Smirnov test, and the significance of the difference between standard deviations. These were applied to eight 100-case samples of basic airmen who had been tested and retested on alternate forms of the Armed Force Qualification Test. A control sample was selected, and the test scores from the other 7 samples were altered to replicate conditions producing false scores. The sign test proved more efficient than the other techniques, identifying 6 of the 7 samples containing fallacious data. The other two techniques each identified 4 of the 7 samples, but not the same 4 samples.
- 170 Flyer, E.S. & Potter, N.R. Characteristics of basic airmen willing to volunteer for a six-year tour in missile squadrons. February 1959. (WADC-TN-59-35, ASTIA Document AD-210 476) (Project 7719, Task 17119) (OTS). Low retainability of first-term airmen assigned to missile squadrons may affect appreciably the effectiveness of these units. Research was initiated to determine the number and type of basic airmen willing to volunteer for a 6-year tour in missiles, one possible solution to the retention problem. A large group of basic airmen were asked whether or not they would volunteer for a 6-year tour in missiles, and about 42% were willing to extend their tours of duty for this type of assignment. Volunteers and nonvolunteers were then compared for a variety of psychological and background characteristics. Results indicate that self-selection processes operating in a volunteer program would provide missile units with a somewhat superior airman in terms of aptitude and personal adjustment, and a very superior airman in terms of retainability and motivation.
- 171 Mullins, C.J. Prediction of creativity in a sample of research scientists. February 1959. (WADC-TN-59-36, ASTIA Document AD-211 039) (Project 7719, Task 17106) (OTS). In an attempt to identify test predictors of scientific creativity, 2 criteria of creativity were used: supervisors' ratings

and number of publications. An interest questionnaire, a vocabulary test, and 9 tests of the Guilford Creativity Battery were administered to 131 physical research scientists. Of 42 test scores derived from the battery, 4 were significantly related to the rating criterion and 7 to the publications criterion. The 2 criteria were not significantly related to each other and none of the predictor scores correlated significantly with both criteria. A composite predictor gave promise of increasing effective prediction of the ratings criterion, but not of the publications criterion.

- 172 Morsh, J.E. & Radliff, F.R. Occupational classification in some major government agencies. March 1959. (WADC-TN-59-37, ASTIA Document AD-212 540) (Project 7734, Task 97002) (OTS). From information obtained during personal visits and conferences, current practices in occupational classification in some major military and civilian agencies of the Federal Government are reported. Agencies included are: Department of the Air Force, Bureau of Naval Personnel in the Department of the Navy, the Adjutant General's Office in the Department of the Army, the Bureau of Labor Statistics and the Bureau of Employment Security in the Department of Labor, the Census Bureau in the Department of Commerce, and the U.S. Civil Service Commission. The prime purpose of the survey was to generate hypotheses for the furtherance of occupational classification research in the Air Force. In a concluding section of the report the state-of-the-art of occupational classification is discussed and research implications are suggested.
- 173 Ward, J.H., Jr. Use of a decision index in assigning Air Force personnel. April 1959. (WADC-TN-59-38, ASTIA Document AD-214 600) (Project 7719, Task 17112). Those responsible for the distribution of Air Force personnel need to make decisions about the estimated worth of individuals in various jobs and about the assignment of individuals in a manner that will maximize the overall effectiveness of the Air Force. This paper presents techniques to aid in arriving at such decisions. A system is developed that will provide a Decision Index for each individual in each proposed job assignment. Methods are described of computing and arraying the indexes for use in determining personnel assignments.
- 174 Brokaw, L.D. School and job validation of selection measures for air traffic control training. April 1959. (WADC-TN-59-39, ASTIA Document AD-214 884) (Project 7719, Task 17108) (OTS). As a joint effort of the Federal Aviation Agency and the Personnel Laboratory, a large battery of experimental tests was administered to trainees entering the CAA Air Traffic Control School in the summer of 1956. Instructor ratings and lecture grades were collected at the end of the course. One year after the men had graduated they were identified on the job to collect supervisory ratings of their proficiency and data on recommendations for promotion. A battery of tests suitable for administration as a screening device was selected on the basis of the training validation. These tests displayed satisfactory validity on the job, and produced a composite validity significant beyond the 1% level for on-the-job criteria. Of several experience variables, CAA certification proved the most valid and added appreciably to accuracy of predicting training criteria.
- 175 Judy, C.J. An Analysis of qualifications data on a group of Air Force mechanics. June 1959. (WADC-TN-59-40, ASTIA Document AD-216 454) (Project 7734, Task 17018). The problem of this investigation was to determine whether selected qualification variables will predict a measure of job proficiency. The subjects were 415 Air Force mechanics specializing in the maintenance of a heavy bomber aircraft. By intercorrelation and multiple regression techniques, 3 groups of variables were identified and evaluated for their power in predicting scores on a written test of job proficiency. The group composed of specific high school courses showed no relationship to the criterion. A second group (education level, time in the Air Force, and Air Force training courses not specific to the equipment maintained) were individually predictive of the criterion, but added nothing to prediction from a composite of the other variables. The third group (Mechanical Aptitude Index, Air Force training courses specific to the equipment maintained, and Air Force maintenance experience) were individually predictive, and, in combination with the other qualification variables, added significantly to the composite prediction.
- 176 Wiley, J. Determining job qualifications requirements by rating Air Force task statements. July 1959. (WADC-TN-59-41, ASTIA Document AD-226 280) (Project 7734, Task 17018). The underlying assumption of this study is that personnel qualifications for new Air Force jobs can be evaluated at the task level as distinguished from the whole-job level. If successful, this approach would permit increased freedom in organizational planning and planning for assignment of personnel.

who possess unusual skills. This report describes a study designed to measure the reliability of ratings made on Air Police tasks. A pilot study using 4 raters indicated considerable agreement on the amount of each of 9 qualification categories needed to perform 80 Air Police tasks. A second study with 10 raters, 7 qualification categories, and 50 of the original 80 tasks produced ratings with reliability coefficients in the .70's for pools of 5 raters. Each rater was scored for his agreement with the others preliminary to development of a task rating scale for use in determining rater bias or rater tendencies.

- 177      McReynolds, Jane. Airman performance on the General Aptitude Test Battery and the Airman Classification Battery AC-2A. July 1959. (WADC-TN-59-42, ASTIA Document AD-225 115) (Project 7719, Task 17106) (OTS). Tests of the General Aptitude Test Battery (GATB), which the U.S. Employment Service (USES) uses for job counseling and placement, were administered to large samples of male airmen in 1949 and 1958. This paper reports comparisons of the results with normative data for the general working population (male and female). Airman means for the 7 aptitude scores derived from paper-and-pencil tests of the GATB were distributed about equally above and below the USES norms, with the 1958 sample deviating from the norms less than the 1949 sample. The more significant differences were accounted for by known sex differences in the aptitudes measured. Both airman samples had smaller proportions of very high and very low scores than the USES distribution. This restriction was attributed to Air Force screening on a mental qualifying test and to self-selection. 2 tables give estimates of proportions of airmen qualifying for USES job categories and for airman career fields.
- 178      Cox, J.A. & Mullins, D.E. Evaluation of light plane training among AFROTC student officers. July 1959. (WADC-TN-59-43, ASTIA Document AD-219 473) (Project 7719, Task 17109). The AFROTC Flight Instruction Program (FIP) offered 36.5 hours of light plane training in the 1956 school year. 41 detachments took part in this program the first year. Using successful progress and completion confirmed by a series of progress check rides as a criterion of FIP success, small relationships were found between success and scores from the AFOQT. A sample of detachments at which FIP was not given the first year was selected to match 37 of the FIP detachments on selected variables. The men from the 2 samples (FIP trained and Non-FIP trained) were compared as to proportions entering preflight training, which was considered as a criterion of interest in flying and interest in an Air Force career. No significant differences were found. The same samples were compared as to proportions eliminated from primary pilot training. Significantly more Non-FIP men were eliminated than were FIP men, and this difference was mainly due to flying deficiency elimination.
- 179      Brokaw, L.D. Prediction of Air Force training and proficiency criteria from Armed Forces selection tests. August 1959. (WADC-TN-59-194, ASTIA Document AD-227 635) (Project 7719, Task 17104). Appropriateness of the Armed Forces Qualification Test for use in Air Force pre-enlistment screening is indicated by data showing the positive correlation of AFQT scores with final grades in technical training courses and with scores on Airman Proficiency Tests. There is nothing in the data to suggest that the test could be changed in a manner to improve its across-the-board prediction of success in Air Force specialties.
- 180      Wiley, L., Harber, H.B., & Giorgio, M. Joyce. Rater tendencies in estimating qualifications required by Air Force tasks. September 1959. (WADC-TN-59-195, ASTIA Document AD-227 634) (Project 7734, Task 17018) (OTS). To forecast qualifications requirements of new Air Force jobs by using estimates of judges, the judgments must be accurate and consistent. The purpose of this study is to determine whether personal evaluation habits may influence interrater agreement. A group of ROTC pilot trainees rated tasks drawn from 15 Air Force career fields and the specialties that include them. Judgments were made on 5-point scales to determine how much resourcefulness, general vocabulary, tool and instrument knowledge, number skill, physique and stamina, human contact skill, precision, formal training, and on-the-job training time is needed. Correlation of each rater's overall mean rating in one session with that of the mean for the second session demonstrated consistent tendencies to give high, low, or medium ratings. Similar correlations between mean standard deviations gave evidence of individual tendencies to use or refrain from using the extremes of the rating scale.

- 181 Brokaw, L.D. Prediction of Air Force training and proficiency criteria from Airman Classification Battery AC-2A. October 1959. (WADC-TN 59-196, ASTIA Document AD-228 445) (Project 7717, Task 87006). This Note reports the validity of Airman Classification Battery AC-2A during the first 14 months of its use. Data are presented for 46 specialties for which both technical training and job proficiency criteria were available (Final School Grades and Airman Proficiency Test scores). Technical training validities are given for an additional 20 technical schools. The expectation of some reduction of general validity as a function of maximizing differentiating power was realized. Slightly greater drops in general validity than had been anticipated were found in the mechanical and administrative aptitude clusters, while the remainder of the battery showed validity comparing favorably with the preceding Battery AC-1B. Battery AC-2A demonstrated itself to be an effective instrument for differential classification; interpretation of its validities are made in this frame of reference. Current Air Force policies require a different kind of instrument for most effective recruitment and placement of new airmen.
- 182 Leczner, W.B. Preparation of the Airman Classification Test-1960. October 1959. (WADC-TN-59-197, ASTIA Document AD-228 453) (Project 7717, Task 87002). The Airman Classification Battery was used for classification of basic airmen from 1948 to 1959. Introduction by the Air Force of selective enlistment required the development of a new instrument for use by the Recruiting Service in pre-enlistment aptitude testing. A preliminary form, for use in 1960, was developed by abbreviating and simplifying administration of Airman Classification Battery AC-2A. The reduced battery requires only 4 hours for administration. It retains elements that provide aptitude indexes equivalent to 4 of the 5 indexes of Battery AC-2A. A table gives the content of each subtest, the time limits, and the composition of the 4 aptitude indexes.
- 183 Tupes, E.C. Personality traits related to effectiveness of junior and senior Air Force officers. November 1959. (WADC-TN-59-198, ASTIA Document AD-231 256) (Project 7719, Task 17110) (OTS). A previous study showed that officer candidates in training can produce reliable personality ratings of their peers that are predictive of effectiveness ratings as Air Force junior officers. This study repeats the investigation with field-grade officers. It was found that the factor structure underlying peer ratings of personality traits of senior officers closely resembled that of the junior officers. There was agreement with one exception between junior and senior officers on the relative importance for officer effectiveness of 30 personality traits. The 2 groups showed even greater similarity in the relationships of the personality trait ratings to Officer Effectiveness Reports. Hence any officer selection program which screens on personality variables essential to junior-officer success will also select for traits characteristic of effective field-grade officers.
- 184 Gough, H.G. Fekability of the Air Force Preference Inventory. November 1959. (WADC-TN-59-199, ASTIA Document AD-231 379) (Project 7730, Task 77353; Contract AF 18(600)8, Institute of Personality Assessment and Research, University of California, Berkeley) (OTS). This study concerns (a) recognition of the possibility of faking responses to the Air Force Preference Inventory in order to present a better impression, (b) consideration of a possible index for detecting faking, and (c) an analysis of the psychological correlates of this index. Effect of faking was revealed by comparison of 3 Inventory scores made by an experimental sample of 30 college students tested under normal administration and then requested to fake. From items showing marked differences in the second testing, a dissimulation scoring key was constructed and applied to the college student sample and 2 Air Force officer samples. Significant differences were found between dissimulation scores of normal vs faked testing of the college student group and there was a negative correlation between the 2 sets of scores. Testing of additional samples would be needed to establish precise cutting points for distinguishing between authentic and faked test protocols.
- 185 Judy, C.J. Relationships between available qualifications data and initial assignment. December 1959. (WADC-TN-59-200, ASTIA Document AD-230 967) (Project 7734, Task 17018). Initial assignments in the Air Force are made on the basis of those qualifications identifiable at the time of enlistment which presumably are related to success in the various position types which make up Air Force specialties. The problem of this investigation was to determine how accurately initial assignment can be predicted from a knowledge of aptitudes, education, physical condition, and other supposedly relevant data routinely assembled on entering airmen. Multiple-regression analysis, using

data on two 1000-man groups, was the principal statistical procedure. Under conditions prevailing at the time, it was found that variables of the kind examined, altogether, can be used to explain from 30 to 47% of the variance in job family assignment, depending upon the particular job family considered. Aptitudes and counselor recommendations played major roles in the prediction, but physical-profile data were of little value. Education variables, taken by themselves, were found to predict assignment, but they did not add significantly to prediction from other available information.

- 186     Flyer, E.S. Factors relating to discharge for unsuitability among 1956 airman accessions to the Air Force. December 1959. (WADC-TN-59-201, ASTIA Document AD-230 758) (Project 7719, Task 17155). This report gives major findings from a large-scale research investigation in which suitable and unsuitable airmen were compared for a number of personal attributes. Educational level was the best single predictor of unsuitability discharge, although aptitude and age considered in conjunction with educational level increased significantly the accuracy of prediction. The implications of the findings for current selection procedures are discussed.
- 187     Brokaw, L.D. Prediction of criteria for medical and dental specialties from Airman Classification Battery AC-2A. December 1959. (WADC-TN-59-202, ASTIA Document AD-231 257) (Project 7717, Task 87006) (OTS). Validation of Battery AC-2A for training grades in 5 medical and one dental specialty, and for Airman Proficiency Test scores in 2 medical career fields (Pharmacy Specialist, Medical Administrative Specialist) reveals a satisfactory predictive efficiency for the General Aptitude Index. Although the Electronics Aptitude Index seems of equal validity, there is no basis for recommending a change in the selective aptitude index.
- 188     Mullins, C.J. & Cox, J.A. Construction and validation of the Instructor Aptitude Test. December 1959. (WADC-TN-59-203, ASTIA Document AD-230 968) (Project 7719, Task 17104). A test was constructed for predicting success in Technical Instructor Schools, using items previously proved valid for General Instructor School success and for Pilot Instructor School success. It consists of 4 parts: verbal, arithmetic reasoning, social insight, and interest. The test was normed for instructors now performing on the job. Validation coefficients were obtained between test scores and course grades in schools at 6 Air Force bases. Validities ranged from .06 to .63, with 5 of the 6 highly significant. These compare favorably with validities of the General Aptitude Index of the Airman Classification Battery for the final school grade criterion. Test scores identified eliminees from Technical Instructor Schools with considerable accuracy.
- 189     Vanasek, F.J. & Cox, J.A., Jr. Development of a position description system for Project Square Peg. January 1959. (WADC-TR-59-35, ASTIA Document AD-208 859) (Project 7727). Project 7727 was initiated to provide operational support for ARDC Headquarters Project Square Peg. Research and development job-man matching was the primary problem which in turn required investigation into position description, personnel description, and matching methods. This report presents the plan for carrying out the 3 tasks and outlines progress in developing position descriptions. Materials used to gather information about position requirements are reproduced in an appendix.
- 190     Schweiker, R.F. Stability of interest measures and their validation for selection and classification. May 1959. (WADC-TR-59-36, ASTIA Document AD-215 482) (Project 7719, Task 17104; Contract AF 18(600)1358, Educational Research Corporation) (OTS). To determine the suitability of interest measures for Air Force personnel selection, 2 multiple-scale interest measures, Activity Preference Report and Opinion Inventory, were given to 16,665 recruits, to 1,465 of the initially-tested airmen near completion of basic training, and to 1,043 of the initially-tested airmen when completing technical school for one of 5 selected career fields. Career Preference Items and a Reenlistment Intent item were given in the first 2 testings and measures of satisfaction with the career field and the Air Force were given in the third testing. Technical school grades and aptitude indexes were obtained for the airmen in the third testing. The interest measures and the Reenlistment Intent item indicated differences among groups at the 3 basic training bases and among groups later assigned to 5 career fields. They also indicated that some changes occur during basic training and technical school training. In a multiple regression analysis, the interest measures did not provide useful prediction of school success, reenlistment intent, or other indications of career satisfaction, although they are accurately measuring something of importance.

- 191 Fiske, D.W., Cox, J.A., Jr., & van der Veen, F. Consistency and variability in peer ratings. May 1959. (Part I, WADC-TR-59-37(I), ASTIA Document AD-215 483; Part II, Appendix, WADC-TR-59-37(II), ASTIA Document AD-215 484) (Project 7719, Task 17109; Contract AF 41(657)157, University of Chicago). This study tests the assumptions that peer and observer ratings are consistent over tasks, over groups, across types of traits, and over time. An additional goal was to examine the reliability and nature of "variability" scores taken from rating data. Men were assigned to 6-man groups which worked on problems in 2-hour shifts, after which they were rated on 7 traits by peers (work-group members) and observers. The groups were reorganized and the procedure was repeated. The primary finding is that the group making the ratings (either peer or observer) has a marked effect on the ratings. There is little effect on ratings due to type of work, rater role (peer or observer), or time. Generalized or global traits are rated more consistently from session to session than traits specific to behavior in the situation. The research shows that reliable variability scores can be obtained from rating data, but there is little evidence concerning what these scores mean. There is a hint that they are inversely related to measures of sociability and initiative.
- 192 Merck, J.W. & Ford, F.B. Feasibility of a method for estimating short-term and long-term effects of policy decisions on the airman personnel system. June 1959. (WADC-TR-59-38, ASTIA Document AD-217 079) (Project 7719, Task 17114) (OTS). This report describes and indicates the utility of a model which simulates the flow of airmen through the Air Force personnel system under a given set of policies. This model makes it possible to estimate, with as much accuracy as is available in the input information, the effects of that set of policies at future points in time. These effects may be gauged in terms of the future distribution of grade levels, career fields, or other pertinent information which may be built into the model.
- 193 Schweiker, R.F. & Curran, R.J. Variables contributing to regular officer procurement panel scores. July 1959. (WADC-TR-59-39, ASTIA Document AD-220 791) (Project 7719, Task 17110; Contract AF 41(657)238, Educational Research Corporation). The purpose was to determine what information from personnel folders, in addition to the Overall Evaluation on Officer Effectiveness Reports, can be objectified to replicate operational panel evaluations. A random sample of 500 cases was drawn for both the rated and nonrated regular officer applicants in the 2-year, 8-year, and 14-year groups. Data were collected for 28 items of information which appear in the personnel records and could be objectified. Correlation with Panel Scores and beta weights for 18 variables were computed. Multiple correlation coefficients for a set of 5 cumulative predictors showed that the Panel Scores can be predicted fairly well from combinations of a few easily obtained measures. By far the most important predictor is the Mean Overall Evaluation rating on Officer Effectiveness Reports.
- 194 Votaw, D.F., Jr. Functional tests of solutions of personnel assignment problems. August 1959. (WADC-TR-59-358, ASTIA Document AD-229 881) (Project 7719, Task 17112; Contract AF 41(657)4, Yale University). The purpose was to carry out functional testing of computerized methods of solving quota problems associated with Air Force personnel procurement. The functional tests proved that, with an electronic computer, an organization such as the Air Force could quickly carry out assignments of large numbers of persons (e.g., 10,000) in an effective fashion; and could rapidly determine, for a given group of persons, whether the quotas and minimum qualifying scores are compatible. 6 appendixes give technical details of the development of procedures and programs and the results of successive tryouts.
- 195 Kosack, C.F. & Beckwith, R.E. The mathematics of personnel utilization models. November 1959. (WADC-TR-59-359, ASTIA Document AD-233 775) (Project 7719, Task 17112; Contract AF 41(657)160, Purdue University) (OTS). This report deals with the development of a personnel utilization model, with special attention to the problem of estimating cost to the Air Force resulting from varied policies governing selection, classification, and training of personnel. An actual model is constructed, including definitions, flow diagrams, and an illustration showing application of the model to the problem of personnel distribution for airmen during their first 4 years of service. A further development presents a specialization of the general model, using the mathematics of Markovian processes. The Air Force could benefit from evolving a model of its personnel program not only by thus solving heretofore unresolved model problems, but also by the examination of Air Force operations essential to development of the model and the identification of areas in which personnel research is likely to be most productive.

- 196 Wherry, R.J., Stander, M.E., & Hopkins, J.J. Behavior trait ratings by peers and references. December 1959. (WADC-TR-59-360, ASTIA Document AD-239 098) (Project 7719, Task 17109; Contract AF 41(657)222, The Ohio State University Research Foundation) (OTS). Experience has shown that reliable trait ratings by peers can be secured during officer training that have appreciable validity for later ratings of officer effectiveness. This investigation tests the hypothesis that equally reliable and valid ratings can be secured from individuals listed as references by applicants for officer training. 4 rating forms were developed, each using the same descriptive adjectives selected by factorial analysis of a preliminary check-list form. From the results of tryouts with college students, a check-list form and a modified forced-choice form were selected for mailing to references listed by the criterion sample of male undergraduate college students. Results from a 71% return of reference ratings showed that: (a) reliability, assuming an equal number of raters, was consistently lower than for peer ratings; (b) correlation with the criterion of peer nominations was markedly lower than for peer ratings, but was reasonably high for one class of raters (educators); (c) the check-list rating form brought a higher proportion of returns and yielded a higher validity than the modified forced-choice form.
- 197 Taylor, E.K. & Parker, J.W. Spatial tests as predictors of success in Air Force training. December 1959. (WADC-TR-59-361, ASTIA Document AD-239 270) (Project 7719, Task 17104; Contract AF 41(657)125, Personnel Research and Development Corporation, Cleveland, Ohio) (OTS). The Airman Classification Battery includes 2 measures of spatial ability. In a search for possible improvement of coverage, 20 spatial tests were investigated to determine their validity for predicting success in Air Force training courses in 5 career fields representing the 5 aptitude indexes used in airman classification and assignment. Factor analysis indicated that a heterogeneous test was a better measure of spatial ability than were tests composed of homogeneous items. Of the final school grade criteria, those for Aircraft Mechanic were most predictable both from Airman Classification Battery tests and from the spatial tests. Those for Organizational Supply Specialist were least predictable. Of the spatial battery tests, the most promising for a place in a differential classification battery is the heterogeneous subtest, Space Survey I. This had high validity for mechanical training but generally lower validity for other training.
- 198 Elliott, Lois L. Effects of item construction and respondent aptitude on response acquiescence. December 1959. (WADC-TR-59-362, ASTIA Document AD-238 787) (Project 7719, Task 17124). Measures of personality, attitude, and opinion are affected by individual differences in response bias. The tendency of basic airmen to agree or disagree with presented statements was investigated to determine its relationships with the form and content of the item and with the aptitude level of the examinee. Airmen at 3 aptitude levels were given 4 kinds of test content in 3 different item formats. Responses were scored for agreement with the item statement. Analysis of variance showed that extent of acquiescence varied with the form of the items, the content of the items, and the aptitude of the airmen. Further investigation of the complex relationships is needed to determine how questionnaires may be constructed and scored to control effects of the tendency to acquiesce.

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- 199 Miller, R.E. Predicting achievement of cadets in their first two years at the Air Force Academy. January 1960. (WADD-TN-60-37, ASTIA Document AD-238 791) (Project 7719, Task 17109). As cadets progress through the Air Force Academy it becomes possible to secure new criteria against which selection and experimental tests may be validated. The present study reports the predictive validities of an operational selection battery and an experimental battery administered to the class of 1959. Academic and leadership criteria maturing at the end of both the first and second years at the Academy are used. Validities of the selection battery held up well against criteria maturing in the second year, and the experimental battery contains predictors which may be worth further development. Attention is called to the highly selected character of the cadet sample and to possible effects of homogeneous ability groupings in certain academy classes.



- 200 Brokaw, L.D. & Tomlinson, Helen. Impact of a negatively weighted variable on the validity of an aptitude index. January 1960. (WADD-TN-60-38, ASTIA Document AD-237 209) (Project 7717, Task 87006) (OTS). Effect of a negatively weighted variable as part of a composite score is determined by comparison between the characteristics of such composites and the characteristics of the composites with that variable removed. The validity of the aptitude indexes was increased, but not significantly, by eliminating the negatively weighted element. The aptitude indexes containing the negatively weighted elements were not appreciably correlated with each other; but the composites without the negatively weighted elements were positively intercorrelated. The results support the use of negatively weighted elements in the aptitude indexes of differential classification batteries; they indicate that other purposes are best served by batteries involving only positively weighted elements. This conclusion is pertinent only to aptitude composites whose components all have positive validity.
- 201 Cobb, B.B. Conversion of aptitude indexes between forms AC-1B and AC-2A of the Airman Classification Battery. February 1960. (WADD-TN-60-39, ASTIA Document AD-237 210) (Project 7719, Task 17106). The study represents an empirical approach by which scales have been developed to facilitate conversion of aptitude indexes derived from the Airman Classification Battery AC-1B to equivalents of corresponding aptitude indexes for the Airman Classification Battery AC-2A. The Armed Forces Qualification Test score was used as a reference variable to select and equate an AC-1B sample with an AC-2A sample. Frequency distributions were obtained for each of 4 sets of corresponding indexes and conversion tables were derived by the equipercntile technique. These tables are appropriate for use when comparing qualifications of individuals tested by different forms of the Airman Classification Battery.
- 202 Valentine, L.D., Jr. A factor-analytic study of the USAF Officer Activity Inventory. March 1960. (WADD-TN-60-40, ASTIA Document AD-238 087) (Project 7719, Task 17108) (OTS). This analysis was designed to determine the actual number of distinct fields of interest that can be identified by an interest inventory scaled for 16 officer career fields. 2 factor-analytic techniques were applied to the 16 job-interest scores for a sample of new officers. The analyses each yielded 5 significant factors (Combat and Operations Interest, Administrative Interest, Technical Interest, Quantitative Interest, and Administrative (Personnel) Interest) with corresponding factors defined by almost identical clusters of interest scales. In each analysis, one of the factors, Administrative (Personnel), was a subset of scales included in the broader Administrative factor. Thus 4 distinct interest areas were defined whose definition established their equivalence to the 4 interest measures included in the Air Force Officer Qualifying Test, and confirmed the judgment that 4 interest scales were adequate in the officer test battery. The factor analyses, presented in detail in the appendixes, show how an incomplete hierarchical structure can be handled by the Schmid-Leiman hierarchical factor model.
- 203 Miller, R.E. Predicting achievement of cadets in their first year at the Air Force Academy, class of 1960. March 1960. (WADD-TN-60-41, ASTIA Document AD-238 792) (Project 7719, Task 17109). Each entering class is administered batteries of selection and experimental tests. To a large extent this study replicates previous investigations of test validities at the Air Force Academy. Many of the formerly high validities continue to be relatively high, but a general decline is seen when comparison is made with validities against early criteria for the class of 1959. The decline probably is the effect of more rigorous selection standards applied to the class of 1960. The highly selected nature of the sample is indicated, and the possible effect of homogeneous ability groupings in certain Academy classes is pointed out. Attention is called to the value of unique tests in the batteries, even though their predictive validities may be low.
- 204 Creager, J.A. & Miller, R.E. Predicting achievement of cadets in their first year at the Air Force Academy, class of 1961. March 1960. (WADD-TN-60-42, ASTIA Document AD-238 088) (Project 7719, Task 17109). Each class at the Air Force Academy is administered batteries of selection and experimental tests prior to training. The present study reports the validities of these batteries for the class of 1961. The criteria are those which matured after one or two semesters of work at the Academy. Predictive validities of each test in the batteries are presented. Variables which could be compared with the results of previous studies were found to have a fairly persistent pattern of

validities, with a tendency toward somewhat lower coefficients than in previous classes. The selection standards applied to the class of 1961 contributed to the loss. It is possible that other factors, such as changes in course content, may be involved. No adequate explanation has been found, however, for the near-zero validities obtained for certain verbal tests against English course criteria. Promising experimental tests will be cross-validated in future studies.

- 205 **Flyer, E.S. Unreliable airmen in high-risk jobs: Unsuitability in the munitions and weapons maintenance career field. March 1960. (WADD-TN-60-43, ASTIA Document AD-258 315) (Project 7719, Task 17155).** Lack of adaptability screening in procuring personnel for high-risk positions has resulted in some unreliable personnel being assigned to nuclear weapons duties. In addition, some airmen are maintained in nuclear positions after numerous incidents showing instability or irresponsibility. Techniques are available to screen airmen prior to and during assignment to high-risk positions. While unauthorized nuclear detonation will not be precluded by the most intensive personnel screening, many unreliable airmen can be identified and removed from assignments to high-risk career fields.
- 206 **Mullins, C.J. & Cox, J.A. Evaluation of the AFROTC Flight Instruction Program. April 1960. (WADD-TN-60-44, ASTIA Document AD-237 211) (Project 7717, Task 87006).** The AFROTC Flight Instruction Program (FIP) initiated in 1956 is evaluated by comparison of 1957 AFROTC graduates who were given the training and a similar group who were not. Exposure to FIP training produced no significant increase in the proportion of AFROTC graduates electing to enter Air Force pilot training; but FIP graduates exhibited a marked advantage over non-FIP trainees in their lower elimination rates from both primary and basic pilot training. An estimate shows an appreciable saving in cost of flying training attributable to the AFROTC light plane training.
- 207 **Meyer, J.K. & Miller, R.E. Validity of photo interpreter predictors for test and training criteria. April 1960. (WADD-TN-60-45, ASTIA Document AD-238 793) (Project 7719, Task 17108).** To identify predictors of performance in Photo Interpretation School, scores on a battery of 39 aptitude and biographical tests were obtained for 200 photo interpreter trainees. 9 criteria were developed, with 7 of these derived from a photo interpreter proficiency test and 2 from training grades. The best predictors were among the aptitude tests of spatial ability and the aptitude indexes of the Airman Classification Battery (AC-1B). Both test and training criteria proved to be predictable, but the highest validities were against a composite of 7 phase grades.
- 208 **Trites, D.K. & Czymoure, R.N. Characteristics of officers graduating in 1954 from Air Force Institute of Technology programs. April 1960. (WADD-TN-60-46, ASTIA Document AD-237 212) (Project 7719, Task 17155) (OTS).** This note reports the results of a survey of 360 officers who remained in the Air Force and of 151 officers who left the Air Force after graduation from training programs sponsored by the Air Force Institute of Technology. Background information was collected and questionnaires were mailed to each group of officers. It was found that officers remaining on active duty are generally older, have more rank, have spent more time in service, and more frequently are rated than were officers leaving service. Possible methods of improving retainability are identified and discussed.
- 209 **Brokaw, L.D. & Holdrege, F.E. Qualifying aptitude minimums as a function of recruiting and training objectives. May 1960. (WADD-TN-60-134, ASTIA Document AD-238 089) (Project 7717, Task 87006).** This paper discusses the interrelationships among desired performance of technical training graduates, the length, content, and training standards of the course, and the aptitude qualification of the entrants into the training. The impact of shifting the cutting score upon the characteristics of the other factors in the production of airmen trained to the requisite level is examined. The relationships between scores on selection or classification instruments and measures of proficiency, such as a final school grade, are described.
- 210 **Lecznar, W.B. & Davydiuk, Beverly F. Airman classification test batteries: A summary. May 1960. (WADD-TN-60-135, ASTIA Document AD-240 831) (Project 7717, Task 87002).** Assignment to training and jobs has been effectively accomplished by the Air Force through the use of test batteries. 2 basic testing instruments have been used: the Airman Classification Battery and the Airman Qualifying Examination. These 2 tests have been revised periodically to counteract item

obsolescence incurred by technology changes, to protect test security, and to use new test theory. Validation studies have prompted some of the revisions in test content, format, and administration. This report compiles a review of each form of these tests, together with development information, and citation of published reports.

- 211 Whitlock, G.H. The status of morale measurement, 1959. May 1960. (WADD-TN-60-136, ASTIA Document AD-243 825) (Project 7719, Task 17130; Contract AF 41(657)247, University of Tennessee) (OTS). This review and critical analysis of attempts at morale measurement presents the first phase of an investigation aimed at developing an effective means for measuring morale among Air Force personnel. The uses of morale measures as predictors and as criteria are noted, and the implications of each usage for measurement are discussed. The problem of scale dimensionality is analyzed, and studies are cited demonstrating the confusion resulting from erroneous assumptions of unidimensionality. An analysis of low intercorrelations among diverse morale measures emphasizes notions of dimensional relevance and concept relevance. A review of definitions of morale points out such problems as the equating of job satisfaction and morale, individual and group references, and definitions for which no measurement operations presently exist. The collection of methodologies and conceptualizations which, in effect, constitute the body of morale theory, is reviewed with particular attention to conclusions drawn from factor analysis.
- 212 Cureton, E.E. Dimensions of airman morale. June 1960. (WADD-TN-60-137, ASTIA Document AD-245 845) (Project 7719, Task 17130; Contract AF 41(657)247, University of Tennessee) (OTS). In an attempt to determine and measure aspects of airman morale, 167 questionnaire items were assembled and administered to 1000 airmen. By cluster and factor-analytic techniques, 8 scales were derived, one of them defined as a measure of General Morale. 3 of the scales are fairly independent of each other, but closely related to the General Morale Scale: satisfaction with the Immediate Supervisor, with the Air Force as a Military Organization, with the Job, and with the Civilian Community. The Supervision scale is the only one clearly defined as measuring a uniquely identified facet of morale. For the other scales, a different approach in the analysis could yield another equally defensible set.
- 213 Cureton, E.E. & Sargent, B.R. Factor-analytic reanalysis of studies of job satisfaction and morale. July 1960. (WADD-TN-60-138, ASTIA Document AD-248 076) (Project 7719, Task 17130; Contract AF 41(657)247, University of Tennessee) (OTS). This is one of 4 papers reporting development of scales for measuring morale among Air Force personnel. Data from published reports of 6 previously developed scales were reanalyzed and the results compared with those for the scales developed in this project. Factor analyses show nearly all the scales with high loadings on the first centroid factor, indicating a large general factor, termed "morale" or "general attitude toward the organization." The one consistent separate factor was "Supervision." Variation in other factors from study to study is attributed in part to differences in attitude structuring among the various samples of workers, but in larger part to differences in the content and organization of the particular scales used. The report includes a discussion of special problems in factoring small matrices.
- 214 Judy, C.J. A regression analysis of one set of Airman Proficiency Test scores. June 1960. (WADD-TN-139, ASTIA Document AD-240 361) (Project 7734, Task 17018) (OTS). One criterion for airman skill upgrading in the Air Force is met by attaining a qualifying score on a applicable Airman Proficiency Test (APT). This note reports an analysis which shows the proportion of variance one such test has in common with selected measures of training, experience, education, aptitude, supervisory opinion, and airman attitudes for 384 aircraft mechanics tested in 1956 and 1957. Each of these categories of information, except airman attitudes, could be used to predict the APT Criterion at some level of effectiveness, but only the training variables and the aptitude variables added significantly to the prediction attainable by using all other available information. Results show the utility of APT scores in defining one important aspect of airman proficiency.
- 215 Ewart, F.S. Factorial structure of airman peer nominations. June 1960. (WADD-TN-60-140, ASTIA Document AD-241 425) (Project 7719, Task 17155) (OTS). A factor analysis of the intercorrelations of 25 peer nomination traits administered to 11 flights of airmen in basic training yielded 4 interpretable factors. These were thought to represent dimensions of a "general" rating factor, "good naturedness," "sociability," and "motivation for military life."

- 216 Elliott, Lois L. Factorial structure of airman self-ratings and their relationship to peer nominations. July 1960. (WADD-TN-60-141, ASTIA Document AD-242 388) (Project 7719, Task 17155). Over 600 airmen rated themselves on the same traits for which they later made peer nominations. Self-ratings showed a highly differentiated factor structure, with 8 factors defined as compared with 4 for peer nominations. There was no direct correspondence between the 2 sets of factors. In combination with AFQT category and amount of education, the self-ratings were moderately predictive of peer ratings of a number of traits.
- 217 McCormick, E.J. Effect of amount of job information required on reliability of incumbents' check-list reports. July 1960. (WADD-TN-60-142, ASTIA Document AD-246 439) (Project 7734, Task 17013; Contract AF 41(657)257, Purdue Research Foundation) (OTS). The purpose was to measure what effect the number of questions asked about each task had upon the consistency and amount of information provided by Air Force personnel when completing task inventories. Aircraft Control and Warning Operators (AFSC 27350) were asked to report, by means of a task check list, various combinations of the following information: (a) the occurrence of tasks; (b) the frequency with which the task was performed; (c) the time required; (d) the judged mental difficulty of the tasks. 56 airmen were randomly assigned to one of 4 experimental groups. Each group was asked for one of 4 combinations of 4 types of information. Analysis of variance showed no systematic differences in the number of tasks reported by incumbents who were asked to report 1, 2, 3, or 4 types of information. Incumbents who were required to report more (as opposed to fewer) types of information about their tasks provided more reliable information. There was considerable stability from group to group in the proportion who reported that they performed a particular task.
- 218 Harding, F.D. & Madden, J.M. Analysis of some aspects of the Air Force position evaluation system. July 1960. (WADD-TN-60-143, ASTIA Document AD-242 696) (Project 7734, Task 17015). The job evaluation system used by the Air Force was applied to a sample of positions. Judged by pay-grade conversions, evaluation scores obtained were somewhat inflated, but the evaluations discriminated between higher and lower skilled jobs. A simple average of individual ratings closely approximates the consensus ratings arrived at during 2-man conferences held by the judges. This finding eliminates the reason for limiting the number of judges to the small number who can attend such meetings. By regression analysis, it was found that factors dealing with Knowledge, Adaptability and Resourcefulness, and Attention formed one group of related factors while the factors measuring Responsibility for Safety of Others, Physical Effort, and Job Conditions were related to each other. Although there was overlap within the 2 groups, each factor had a considerable amount of unique variance.
- 219 Gordon, Mary Agnes. Arithmetic reasoning items with formula responses. July 1960. (WADD-TN-60-210, ASTIA Document AD 243 203) (Project 7717, Task 87002) (OTS). This is a study of the effect of practice on item statistics. Some specific practice effects were found. These were not large enough to be troublesome in selecting items for a new test from a pool of experimental items. If experimental items are protected by initial practice items and final time-filling items, most of the practice effects can be controlled. Arithmetic reasoning items with formula responses as used in this study were found to be suitable for moderate to difficult tests of airman aptitude.
- 220 Lecmar, W.B. Equivalence of scores from three airman classification devices. July 1960. (WADD-TN-60-211, ASTIA Document AD-245 431) (Project 7717, Task 87006). Airman Classification Battery, AC-2A, and Airman Qualifying Examination, Forms D and E, were administered in various combinations to groups of examinees. Aptitude composite scores from the several samples were compared for normative purposes and to verify certain differences found in the data obtained during the development of Airman Qualifying Examination, Form E. The results indicate a general comparability of scores from one test to the others, but some isolated variations appeared and some of the deviations found during the Form E development were not replicated. The data did not suggest that AQE-E norms should be revised.

- 221 Madden, J.M. A review of some literature on judgment with implications for job evaluation. August 1960. (WADD-TN-60-212, ASTIA Document AD-245 432) (Project 7734, Task 17013) (OTS). Job evaluation has been described as a psychological process closely resembling those which have been subjected to experimentation both in the laboratory and in practical situations. It is based on the psychophysical method of single stimuli. Predictions from previous research indicate that the evaluation a job receives is most reliable when it is judged in a group with other jobs, and that the composition of this group influences the evaluation it receives. If the presence of these context effects in job evaluation is verified, the next step is to design an adequate procedure for their control. Determination of the optimal method of representing the job to the rater and an examination of the effects of residual factors, such as familiarity of the rater with the job being rated, may also suggest changes in current job evaluation procedures. All of these phenomena should be considered in their relationship to Air Force job-evaluation procedures.
- 222 Cowan, G.E. Development of specialty outlines for collecting job information in the Radio-Radar Systems career field. August 1960. (WADD-TN-60-213, ASTIA Document AD-243 826) (Project 7734, Task 17016) (OTS). This study investigates the feasibility of using an instrument with standard functional work categories to collect occupational information across different specialties of a maintenance career field and at 2 skill levels. Specialty Outlines were developed for the 5- and 7-skill level for 6 AFSCs in the Radio-Radar Systems career field and administered to teams of proficient NCO incumbents. The 7-level outlines were administered twice with a 5-week interval and the 5-level outlines were administered once. Analysis of variance techniques were applied to estimates of the percentage of time spent on each of 13 standard functional work categories. Each team of specialists was interviewed to discuss the content and format of the outline for their AFSC. Results of the analyses and interviews indicate that Specialty Outlines using standard functional work categories are (a) reliable instruments, (b) adequate for use across different AFSCs of a maintenance career field at both the 5- and 7-level, and (c) differentiate between the work activities of 5- and 7-level airmen.
- 223 Brokaw, L.D. Suggested composition of airman classification instruments. August 1960. (WADD-TN-60-214, ASTIA Document AD-252 252) (Project 7717, Task 87002) (OTS). Each test of Airman Classification Battery AC-2A was evaluated for its contribution to Air Force classification procedures. Criteria were success in Air Force technical training and scores achieved on job proficiency tests. By a multiple regression technique, standard beta weights and a squared multiple correlation coefficient were derived for 16 predictors against both criteria for 36 criterion groups. Components for 4 aptitude indexes were selected by reviewing the frequency with which tests appeared among the best 4 predictors within each of 4 job clusters.
- 224 Miller, R.E. Prediction of technical training criteria from AFOQT composites. September 1960. (WADD-TN-60-215, ASTIA Document AD-246 658) (Project 7717, Task 87003). The Air Force Officer Qualifying Test (AFOQT) is used in various officer procurement and selection programs. Scores on this test are of significance in selecting officers for attendance at basic technical courses. A study of 975 reserve officers in 7 different technical courses provided data on the predictive validities of AFOQT composite scores for final technical course grades. Satisfactory validity coefficients were obtained for the AFOQT aptitude composites against the course criteria. Most of the composites were valid for each separate criterion, and coefficients as high as .58 were obtained. These validities persist in different samples of officers enrolled in the same course at different times. Validities of the AFOQT interest composites were markedly lower and frequently negative. The highest in terms of absolute value was .32.
- 225 Elliott, Lois L. Prediction of success in WAF basic training by two background inventories. September 1960. (WADD-TN-60-216, ASTIA Document AD-249 952) (Project 7719, Task 17155) (OTS). As part of a longitudinal study of WAF careers, the Biographical Inventory of the Airman Classification Battery and the WAF Self Report inventory were administered to a 6-months' input of WAF basic trainees. On the basis of item counts for half the sample, keys were developed to predict success in basic training. When cross validated against the remaining part of the sample, moderate validity was obtained for one group and negligible validity for the other.

- 226 Elliott, Lois L. Factor analysis of WAF peer nominations. September 1960. (WADD-TN-60-217, ASTIA Document AD-246 940) (Project 7719, Task 17155) (OTS). A factor analysis of the intercorrelations of 30 peer nomination variables, aptitude, age, and success or failure for WAF in basic training yielded 7 factors. The 3 major factors represented dimensions of leadership, heterosexual adjustment, and agreeableness. The remaining dimensions were motivation, emotional maturity, neatness, and feminine interests.
- 227 Elliott, Lois L. WAF performance on the California Psychological Inventory. September 1960. (WADD-TN-60-216, ASTIA Document AD-246 941) (Project 7719, Task 17155). The California Psychological Inventory was administered to a 6-months' input of WAF basic trainees. Mean scores for the total WAF group exceeded norms for high-school women on all scales except social presence, socialization, flexibility, and femininity. Mean scores of successful WAF exceeded those for the failure groups on all but 3 scales. It was concluded that test performance by the incoming WAF population compared favorably with results from a similar female population.
- 228 Tupes, E.C., Brokaw, L.D., & Kaplan, Margon: N. An application of the hierarchical factor model to the criterion grouping problem. September 1960. (WADD-TN-60-219, ASTIA Document AD-253 013) (Project 7717, Task 87002) (OTS). A hierarchical factor analysis was applied to intercorrelations of the validity coefficients of 14 aptitude tests for 66 technical school criteria. 7 factors emerged: a general, 2 second-order, and 4 first-order factors. From these results it was concluded that the present 5 aptitude indexes could probably be reduced to 4 with little loss in prediction; however, if the number of aptitude indexes were reduced below 4, appreciable loss in prediction would occur. The present aptitude indexes could be reduced to 4 by combining the General and Electronics Aptitude Indexes. Some shifting in courses from one aptitude index to another is suggested.
- 229 Madden, J.M. Context effects in job evaluation. October 1960. (WADD-TN-60-220, ASTIA Document AD-249 950) (Project 7734, Task 17015) (OTS). Judgments may be distorted by a variety of influences. One potent influence is the context in which the object judged is placed. When a list of jobs is being evaluated in a job-evaluation program, each job is presented to the rater in the context of all the remaining jobs on the list. When a list was composed of all high-value jobs, the obtained evaluation scores were lower than the "true" ones. When a list was composed of all low-value jobs, the evaluation scores were higher. On lists containing a majority of high-value jobs, the low-value jobs were judged even lower, and the reverse was true when the list contained a majority of low-value jobs. Suggestions were made for the control of context effects in the Air Force job-evaluation program.
- 230 Christal, R.E., Madden, J.M., & Harding, F.D. Reliability of job evaluation ratings as a function of number of raters and length of job descriptions. October 1960. (WADD-TN-60-257, ASTIA Document AD-251 837) (Project 7734, Task 17015) (OTS). Reliabilities of single ratings and pooled ratings of Air Force job evaluation factors were estimated from ratings on 50 Air Force specialties by student officers attending the USAF Command and Staff School. The Spearman-Brown prophecy formula was found to produce reliability estimates which were practically identical to those obtained by randomly drawing samples and computing the reliability for each one. The interrater and rater-retest reliability of the Air Force job evaluation system was found to be adequate when the composites were based upon an average of the ratings made by 10 to 15 officers at the Command and Staff School. The reliability of such mean ratings did not rise appreciably as the number of raters was increased beyond 20. When the basis of rating was a full-length job description, the raters tended to assign higher values than when they based their ratings on a brief Specialty Summary, but the rank ordering of the specialties remained essentially unchanged. Reliability of the ratings was the same whether long or short job descriptions were used.
- 231 Madden, J.M. A note on the rating of multidimensional factors. October 1960. (WADD-TN-60-258, ASTIA Document AD-249 951) (Project 7734, Task 17015) (OTS). To determine how the reliability of ratings is affected by fractionating a multidimensional rating factor, the complex job evaluation factor, Knowledge, was split into 4 simpler factors: Formal Education, Special Education, On-the-Job Training, Work Experience. Aviation cadets' ratings of 42 Air Force specialties on these 4 factors were somewhat more reliable than ratings on the original multidimensional Knowledge factor. Maximum reliability of rater judgments is suggested as one criterion for the most desirable level of fractionation of a complex factor.

- 232 Miller, R.E. & Creager, J.A. Predicting achievement of cadets in their first year at the Air Force Academy, class of 1962. October 1960. (WADD-TN-60-259, ASTIA Document AD-250 117) (Project 7717, Task 87003). A battery of experimental tests was administered to the Air Force Academy class of 1962 on entry. Results of these tests and previously administered selection tests were correlated with final academic grades and Cadet Effectiveness Ratings earned in the fourth class year. The predictive validities of the tests tended to show some loss when compared with those from previous classes. Shifts in validity patterns for the same tests against the same or similar criteria were also noted. Nevertheless, all criteria proved to be predictable. Prediction of mathematics and science course grades was best accomplished by the Quantitative composite of the AFOQT, while the English achievement test of the College Entrance Examination Board was the most adequate for the prediction of English grades. These findings are consistent with those from other Academy classes. 13 predictors had significant validity coefficients for the prediction of Cadet Effectiveness Ratings, with the best single predictor the experimental Peer Status scale of the Life Experience Inventory.
- 233 Fisher, W.E., Ward, J.H., Jr., Holdrege, F.E., et al. Prediction of unsuitability discharges. October 1960. (WADD-TN-60-260, ASTIA Document AD-248 077) (Project 7719, Task 17155) (OTS). An equation was devised to provide recruiters with a convenient device for estimating the quality of a prospective recruit from 3 predictors: age, education, and aptitude score. This report describes the development of the equation and illustrates its effectiveness in predicting unsuitability discharges. It provides a convenient dial computer for estimating probability of unsuitability discharge.
- 234 Madden, J.M. Familiarity effects in evaluative judgments. November 1960. (WADD-TN-60-261, ASTIA Document AD-248 384) (Project 7734, Task 17015) (OTS). This report is one of a series dealing with rater bias in job evaluation. It was found that the more familiar the rater is with the job being evaluated, the higher his rating is likely to be. This effect was observed for 5 of the 14 rating factors used: Adaptability, Decision-Making, Managerial and Supervisory, Mental Work, and Working Conditions. Methods are suggested for controlling the familiarity effect in the Air Force job evaluation system.
- 235 Madden, J.M. A comparison of three methods of rating-scale construction. November 1960. (WADD-TN-60-262, ASTIA Document AD-252 251) (Project 7734, Task 17015) (OTS). 4 job evaluation factors were used as the basis of rating 10 Air Force specialties. For each factor, 3 different methods were used in constructing the scale: (I) each scale division was defined and illustrated; (II) neither scale division definitions nor examples were used; and (III) definitions were used but examples were omitted. Ratings by samples of aviation cadets were analyzed for effects of method on mean ratings. For 3 of the 4 factors, the mean ratings obtained were not different as a function of the method of scale construction. Methods I and III were about equally reliable, both yielding more reliable means than method II. Method III is suggested as being the most effective because the task of the rater is somewhat simpler than for method I and the reliability is higher than for method II.
- 236 Christal, R.E. & Madden, J.M. Effect of degree of familiarity in job evaluation. November 1960. (WADD-TN-60-263, ASTIA Document AD-250 118) (Project 7734, Task 17013) (OTS). A significant association between the familiarity of the rater with a job and the ratings he assigns to the job was found for 17 of 50 Air Force specialties. Assuming that the most valid ratings are those given by highly familiar raters, it appears that highly technical jobs tend to be under-evaluated by raters who are unfamiliar with the work performed. On the other hand, some jobs tend to be over-evaluated by raters who are unfamiliar with the work performed. These findings point to the necessity for controlling the level of familiarity when job evaluation is conducted.
- 237 Judy, C.J. Appraisal of education requirements for airman specialties. December 1960. (WADD-TN-60-264, ASTIA Document AD-252 253) (Project 7734, Task 17018) (OTS). Educational requirements for airman specialties are given in Air Force Manual 35-1. This study examines the role of some of these gross indicators of academic achievement in predicting technical school grades. Attention was restricted to the educational information shown on testing and assignment record cards completed for a sample of airmen in 13 Air Force specialties. By linear regression techniques it was found that the joint contribution of this limited amount of information permits the prediction of a large part of the variance in technical school grades. High school graduation was the best single

predictor. Completion or noncompletion of particular high-school-level courses, although individually predictive of the criterion measures, did not reach a level of practical significance for any specialty when the effects of other information were controlled.

- 238      **Humphreys, L.G.** Equipercntile conversions as a function of training in a technical curriculum. December 1960. (WADD-TN-60-265, ASTIA Document AD 257 428) (Project 7717, Task 87002; Contract AF 41(657)279, University of Illinois) (OTS). This study examines the effect of training differences on scaling new forms of personnel tests for equivalence to previous forms. 3 classes of a technical high school were given the test against which Air Force classification tests have been scaled, the General Classification Test. In addition, they took a recent form of the Airman Classification Battery. The ability range of these students corresponded closely to that of the airman population, showing that findings from these samples can be generalized to the Air Force input. Differences between sophomores and seniors in equipercntile conversion tables for the aptitude indexes reflected the emphasis in this high school on mechanical training. This was interpreted as a joint effect of the nature of the tests and the nature of this particular high school curriculum.
- 239      **Bottenberg, R.A.** The exploitation of personnel data by means of a multiple linear regression model. December 1960. (WADD-TN-60-266, ASTIA Document AD-257 499) (Project 7719, Task 17112). One broad class of personnel problems involves predicting a criterion (training success, job performance, job knowledge, reenlistment decision) from available predictor information. Effectiveness of personnel utilization depends to a large extent upon effective prediction systems for such criteria. This report describes an iterative procedure for determining weights in a multiple regression problem, programmed for an electronic computer. Large-scale regression problems can be economically computed while avoiding altogether the question of singularity. The procedure permits precise tests of hypotheses, enabling the investigator to express his hunches in full detail in formulating the regression model.
- 240      **Whitlock, G.H. & Cureton, E.E.** Validation of morale and attitude scales. June 1960. (WADD-TR-60-76, ASTIA Document AD-242 359) (Project 7719, Task 17130; Contract AF 41(657)247, University of Tennessee) (OTS). This paper completes reporting of the development of scales for measuring morale among Air Force personnel. A previously developed questionnaire keyed for 8 scales was given to an independent sample. When these scores were compared with criteria derived from interviews, ratings, and Air Force records, validities were uniformly low. Although none of the validities are high enough for useful prediction, the scales do measure expressed attitudes with considerable reliability.
- 241      **McCormick, E.J. & Ammerman, H.L.** Development of worker activity check lists for use in occupational analysis. July 1960. (WADD-TR-60-77, ASTIA Document AD-248 385) (Project 7734, Task 17013; Contract AF 41(657)237, Purdue Research Foundation) (OTS). To determine the consistency with which job incumbents respond to a list of task activities, several forms of check lists were completed by job incumbents in 3 Air Force position types. An identical form was readministered one week later. Consistency in reporting frequency of task performance and length of task time was fairly satisfactory with mean reliabilities around .70. Those for relative proportion of total time per task and for general task difficulty were considerably lower (.53 and .52). From analyses of variance, it was determined that: (a) consistency in reporting task occurrence is not generally related to consistency in reporting other types of task information; (b) a recall period of 6 months elicits more reliable task occurrence information than a one-month period, but the one-month recall yields greater consistency of time and difficulty judgments than the 6-month period; and (c) interactions among experimental factors (scales, recall periods, position and equipment types, methods of response) were generally negligible. The degree of reliability shown and the absence of important interactions are evidence that the check list may prove a useful procedure for gathering information over a large variety of conditions and jobs.
- 242      **Vanasek, F.J.** Development of a data bank for officer effectiveness ratings. July 1960. (WADD-TR-60-78, ASTIA Document AD-244 643) (Project 7717, Task 17110; Contract AF 41(657)244, Data Processing Center). Data from over 700,000 Officer Effectiveness Reports have been accumulated for the years 1954-1958 and recorded on IBM 650 tape. This report describes the procedure whereby the basic data, annual analyses, and a 5-year summary analysis were derived. These records



make available information of value to the Air Force in formulating officer personnel policies and for use as criterion data in personnel research. An appendix itemizes the categories of information recorded.

- 243 McCormick, E.J. & Tombrink, K.B. A comparison of three types of work activity statements in terms of the consistency of job information reported by incumbents. August 1960. (WADD-TR-60-80, ASTIA Document AD-248 386) (Project 7734, Task 17013; Contract AF 41(657)240, Purdue Research Foundation) (OTS). 3 types of work activity statement (tasks, elements, and work actions) were compared for consistency of job information collected through their use in check lists. Check lists of activities of 2 maintenance position types were administered to incumbents and supervisors. These provided for reporting job information on 7 scales: 1. frequency of performance of activities; 2. time required for performance; 3. mental difficulty; 4. physical difficulty; 5. type of training received; 6. type of training desired; and 7. type of assistance obtained. 3 indexes of rater consistency were used: (a) test-retest reliability of scale responses; (b) test-retest reliability of reports about the occurrence of activities; and (c) inter-rater consistency of scale responses. For the quantitative scales (1-4), tasks and elements yielded more consistent information than work actions. With the qualitative scales (5-7), work actions were more consistent than tasks, with elements falling between and not differing significantly from either of them. Patterns of difference were found between the 2 jobs, but there were no systematic differences between incumbents and supervisors in reporting information about incumbents' jobs. Frequency and time information were reported more consistently than mental and physical difficulty; and information about assistance obtained was reported more consistently than training received and training desired.
- 244 Morsh, J.E., Madden, J.M., & Christal, R.E. Job analysis in the United States Air Force. February 1961. (WADD-TR-61-113, ASTIA Document AD-259 389) (Project 7734, Task 17013) (OTS). The Air Force has recently revised the Occupational Analysis Manual which prescribes procedures for job analysis and evaluation. The revised method of job analysis, including the research and development which has led to its present form, is described in this paper. The method centers around the use of the task inventory, while at the same time it includes many of the more desirable features of traditional methods. The uses of job analysis data, statistical treatment, and special problems for future research are discussed. Evidence shows that the method will produce reliable information and will permit economical sampling of many job incumbents. It facilitates quantitative analysis and the organization of information into a form useful to a maximum number of using agencies.
- 245 Ward, J.H., Jr. Hierarchical grouping to maximize payoff. March 1961. (WADD-TN-61-29, ASTIA Document AD-261 750) (Project 7734, Task 17016). This report describes mathematically a general procedure for forming hierarchical groups of mutually exclusive sets in a manner which yields an optimum value for the functional relation, or objective function, that reflects the criterion chosen by the investigator. The number of groups to be formed need not be specified in advance. Given  $k$  sets, this technique permits their reduction to  $k - 1$  mutually exclusive sets by considering the union of all possible pairs that can be formed and the selection of that union which has the highest payoff value with respect to the criterion chosen. This procedure can be repeated until only one set remains. Hence decisions on the number of groups to be used can be based on a knowledge of the "costs" of grouping at each stage. A computer flowchart and a numerical example of the grouping procedure are provided. An appendix shows how to determine the number of possible ways of forming groups and the number of distinguishable unions possible.
- 246 Bottenberg, R.A. & Christal, R.E. An iterative technique for clustering criteria which retains optimum predictive efficiency. March 1961. (WADD-TN-61-30, ASTIA Document AD-261 615) (Project 7734, Task 17016). In a personnel classification program, maximum predictive efficiency results from applying least-squares weights to a set of predictor tests to produce a separate composite score for each criterion. With a large, complex organization such as the Air Force, it is not feasible to compute composite scores to predict the success of every individual in every criterion situation. This paper describes an iterative technique, programmed for an electronic computer, that at each step reduces the number of criterion clusters and provides optimal weights for the tests. A cost table can be used to determine the appropriate balance between predictive efficiency and number of criterion clusters. Solution of a sample problem illustrates each step of the technique.

# AERONAUTICAL SYSTEMS DIVISION (ASD) SERIES

April-December 1961

- 247 Creager, J.A. & Miller, R.E. Summary of regression analyses in the prediction of leadership criteria, Air Force Academy classes 1961 through 1963. April 1961. (ASD-TN-61-41, ASTIA Document AD-263 979) (Project 7717, Task 87003) (OTS). A battery of experimental tests is administered each year to entering cadets at the Air Force Academy. Validities against academic and leadership criteria are routinely determined. Multiple linear regression methods have been applied to the problem of predicting the Cadet Effectiveness Rating as a leadership criterion. This report summarizes the results of such regression studies on 3 Academy classes. Considerations governing the design of each experimental battery are pointed out. Battery validities and regressions are examined within classes, and across classes. Multiple correlations with the criterion ran as high as .49. Interaction variables made no contribution to prediction beyond that of the primary variables. Findings are of use in developing a valid leadership predictor for screening Academy applicants.
- 248 Lecznar, W.B. Development of the Airman Classification Test-1961. April 1961. (ASD-TN-61-42, ASTIA Document AD-261 502) (Project 7717, Task 87002). Airman Classification Test-1961 was developed for use in Air Force personnel classification programs other than selective enlistment. It is a 4-hour test composed of 10 subtests from which 4 aptitude scores can be derived. The battery is adapted for either hand or machine scoring.
- 249 Norman, W.T. Problems of response contamination in personality assessment. May 1961. (ASD-TN-61-43, ASTIA Document AD-262 433) (Project 7717, Task 87003; Contract AF 41(657)269, University of Michigan) (OTS). This survey reports the first phase of a project to develop tests to measure 5 personality variables. Various techniques are defined and these are appraised on the basis of logical implications and empirical findings. Conclusions favored questionnaires composed of forced-choice self-report items as best suited to the purpose of the project. A program is outlined for construction of such tests to produce instruments valid for the selected criterion variable and free from appreciable biasing effects.
- 250 Norman, W.T. Development of self-report tests to measure personality factors identified from peer nominations. May 1961. (ASD-TN-61-44, ASTIA Document AD-267 779) (Project 7717, Task 87003; Contract AF 41(657)269, University of Michigan) (OTS). An experiment: battery of personality tests were constructed as part of a project to develop personality tests appropriate for use in selection of applicants for Air Force officer training. Criteria were peer-nomination ratings previously shown to define personality factors that were predictive of Officer Effectiveness Ratings. Rational selection of testing techniques and item forms was supplemented by information from a series of tryouts with small samples. The battery will be administered to a large sample composed of groups from which reliable peer-rating criteria can be obtained for full cross validation.
- 251 Miller, R.E. Predicting achievement of cadets in their first year at the Air Force Academy, class of 1963. May 1961. (ASD-TN-61-45, ASTIA Document AD-263 980) (Project 7717, Task 87003). Applicants for each class at the Air Force Academy take a battery of selection tests during the winter preceding admission of the class and a battery of experimental tests on entry. Results from both batteries are used as predictors of academic and leadership performance at the Academy. Predictive validities were computed in the class of 1963 for tests in these batteries, using the academic average for the fourth class year and the Cadet Effectiveness Rating for the fall semester of that year as criteria. Both criteria were predictable. Validities for the academic criterion attained a value of .51, while for the leadership criterion the highest validity was .30. The Physical Aptitude Examination, frequently the best predictor of the Cadet Effectiveness Rating, was equaled or exceeded by 6 other more economical predictors. Several different sets of predictors were about equally effective in predicting this criterion. An increase in validities of the High School Activities Index was noted as compared with recent classes. The trend toward lower validities observed in the past several classes did not hold for the class of 1963.

- 252 Christal, R.E. & Madden, J.M. Air Force research on job evaluation procedures. June 1961. (ASD-TN-61-46, ASTIA Document AD-267 346) (Project 7734, Task 17015). This paper reviews present procedures in Air Force job evaluation and outlines a program for improving methods of job evaluation. A short-term program, its results, and current applications are described in terms of (a) desirable rater characteristics, (b) desirable rating situations, and (c) desirable characteristics of rating factors and scales. The long-term program has the objective of making possible an accurate evaluation for every job-type in the Air Force. A method is proposed for determining job-types. Problems of determining grade levels, of selecting factors to be rated, and of scaling and weighting judgments are considered.
- 253 Madden, J.M. A further note on the familiarity effect in job evaluation. June 1961. (ASD-TN-61-47, ASTIA Document AD-263 981) (Project 7734, Task 17015) (OTS). Job evaluations were found to vary as a function of the extent to which raters were familiar with them. In addition, there was an interaction between the job rated and the familiarity level of the rater. It is suggested that an adequate control of the familiarity effect could be maintained by maximizing the familiarity level of the raters. This should be done by using job descriptions and other materials rather than obtaining raters with a high degree of familiarity gained through personal work experience. A personal relationship with the job rated may reduce the validity of the ratings if affective factors are operating.
- 254 Tupes, E.C. & Kaplan, Margorie N. Similarity of factors underlying peer ratings of socially acceptable, socially unacceptable, and bipolar personality traits. June 1961. (ASD-TN-61-48, ASTIA Document AD-266 861) (Project 7717, Task 17110) (OTS). 5 well-defined factors have been found to underly ratings of personality traits when the traits were expressed in bipolar form (e.g., Cooperative vs Obstructive). The present study investigated the factor structure underlying ratings when the traits were presented with socially acceptable definitions alone (e.g., Cooperative vs Not So); with socially unacceptable definitions alone (e.g., Obstructive vs Not So); as well as in the bipolar form. Members of the Air Force Command and Staff School Class of 1959 rated each other (in rating groups of 12 to 14 officers) using one or another of 3 forms designed to obtain bipolar and unipolar ratings. When the 3 intercorrelation matrices were factor analyzed, 5 factors emerged from each. These factors appeared to be the same 5 factors found in previous analyses. The factor structure underlying ratings of personality traits appears unaffected by differences in the polarity of the rating definitions.
- 255 Vitola, B.M. & Cantrell, G.K. An experimental investigation of multiple-choice item structure. July 1961. (ASD-TN-61-49, ASTIA Document AD-264 913) (Project 7717, Task 17131). This study was designed to measure the effect on item difficulty level of the presence or absence of central problems and generic terms in the stems of multiple-choice items. Each of 60 elements of information, appropriate for the average high school student, was reflected in 3 types of 4-choice multiple-choice items. Type 1 questions included both a central problem and generic term; Type 2 questions included a central problem but no generic term; and Type 3 questions included neither a central problem nor a generic term. 3 forms of a 60-item test were assembled to include 20 of each type of question. 3 groups of basic airmen, equated on the basis of AFQT centiles, each completed a different test form. No significant difference was found between any 2 of the mean total scores. Type 1 questions were significantly easier than Types 2 and 3, and Type 2 was significantly easier than Type 3. For basic airmen, use of a central problem alone reduces item difficulty significantly, but the use of a generic term in conjunction with the central problem reduces the item difficulty even more.
- 256 Holdrege, F.E. Factorial structure of basic training performance variables. July 1961. (ASD-TN-61-50, ASTIA Document AD-265 824) (Project 7719, Task 17155) (OTS). Peer nominations of basic airmen on 25 traits had been previously factor analyzed into 6 factors, only 4 of which were interpretable. A new analysis was made with 6 added variables based on tactical instructor ratings and objective measures of aptitude, education, and age. The new analysis duplicates the first 4 factors of the previous analysis (General Rating Factor, Agreeableness, Surgency, Motivation for Military Life). By the addition of age and the aptitude measure to the analysis, the remaining 2 factors of the new analysis can be interpreted as Maturity and Intelligence.
- 257 Humphreys, L.G. Validation of Air Force classification tests against academic grades in an aviation high school. August 1961. (ASD-TN-61-51, ASTIA Document AD-267 799) (Project 7717,

Task 17154; Contract AF 41(657)279, University of Illinois) (OTS). This is the first of a series of reports detailing the long-range validity of Air Force selection tests for technical academic criteria. The Aviation High School provides a unique opportunity for collection of predictor and criterion information for the same individuals over an extended period of time. Course grades showed low to moderate levels of reliability, with those in the terminal aviation-mechanic curriculum somewhat less than grades in the pre-engineering technical curriculum. Most of the multiple correlations of classification test scores with course grades were at a usefully high level. Highest correlations with Air Force aptitude indexes were somewhat lower, and correlations with AGCT still lower. For selection purposes the Air Force classification tests do a better job than the AGCT general intelligence test. The Air Force tests that have the highest utility for selection are Arithmetic Reasoning, Physics, and Pattern Comprehension. Additional mechanical and numerical content, as well as the use of keyed biographical data items, may improve prediction in this school situation.

- 258 Valentine, L.D., Jr. Air Force Academy selection variables as predictors of success in pilot training September 1961. (ASD-TN-61-52, ASTIA Document AD-263 982) (Project 7717, Task 87003) (OTS). Of the first class graduating from the Air Force Academy, 172 entered Flying Training. Scores from the Academy selection tests, given 5 years earlier, were correlated with pass/fail criteria in Primary and Basic Flying Training, and with final grades in Basic Training. None of the College Entrance Examination Board scores were predictive of success in Flying Training. The Pilot composite of the Air Force Officer Qualifying Test had moderately high validity for passing both Primary and Basic Training. Neither of the sets of selection tests showed much discrimination for final grades of the successful students.
- 259 Tupes, E.C. & Kaplan, Margorie N. Relationships between personality traits, physical proficiency, and cadet effectiveness reports of Air Force Academy cadets. September 1961. (ASD-TN-61-53, ASTIA Document AD-264 916) (Project 7717, Task 17110) (OTS). Cadets in 3 Air Force Academy classes rated each other on 20 personality traits as well as on physical ability and officer potential. For 2 of the classes objective measures of physical proficiency were also available. Inter-correlation matrices within each class were analyzed to determine relationships between personality trait ratings and Cadet Effectiveness Ratings (CERs), and to determine the factor structure underlying the ratings. Traits such as responsibility, perseverance, good adjustment, poise, social polish, and social intelligence were most highly related to CERs, while traits of surgency or extroversion such as talkativeness, frankness, adventurousness, and sociability bore little or no relationships to CERs. When compared with OCS candidates and majors attending Command and Staff School, the Academy cadets differed little from these groups in the pattern of the personality trait vs CER relationships. 5 personality trait ratings were identified which correspond closely to the 5 (Surgency, Agreeableness, Conscientiousness, Emotional Stability, and Culture) found in other analyses. A sixth factor was identified as physical ability.
- 260 McReynolds, Jane. Development of screening and selection tests for women. September 1961. (ASD-TN-61-54, ASTIA Document AD-266 865) (Project 7717, Task 87000) (OTS). This report details the development and standardization of replacement forms of the Armed Forces Women's Selection Test and the Women's Enlistment Screening Test. Classification Test R-5, with extended time limits and a revised conversion table, was used as the reference test for standardization of both tests. In the standardization testing, a form of WEST was always administered first, but counter-balanced order of administration of AFWST and the reference test was used to stabilize practice effect. Intercorrelations indicate close relationships between these forms and earlier forms of AFWST and WEST and effective prediction of scores used by the Army and Air Force in classifying enlisted personnel.
- 261 Ward, J.H., Jr. & Hook, Marion E. A hierarchical grouping procedure applied to a problem of grouping profiles. October 1961. (ASD-TN-61-55, ASTIA Document AD-269 516) (Project 7714, Task 773403). This report describes an application of a hierarchical grouping procedure to a problem of grouping test profiles so as to maximize the homogeneity of profiles within clusters. The data are 25 test profiles from a published report of a different grouping technique. The results of the two grouping techniques are compared and desirable characteristics of the hierarchical grouping technique

are demonstrated. It shows not only the order in which profiles must be grouped so as to yield the optimal value of the objective function when the number of profiles is systematically reduced, but also the costs of the grouping at each stage of the hierarchy.

- 262      Holdrege, R.E. & Born, G. Graphic determination of coefficients of part and multiple correlation in three-variable problems. October 1961. (ASD-TN-61-144, ASTIA Document AD-269 526) (Project 7719, Task 771902) (OTS). On many occasions it is convenient to solve equations graphically rather than algebraically. This report provides a convenient means for graphically determining the values of coefficients of part correlation, coefficients of multiple correlation, and beta weights for 3-variable problems.
- 263      Valentine, L.D., Jr. & Creager, J.A. Officer selection and classification tests: Their development and use. October 1961. (ASD-TN-61-145, ASTIA Document AD-269 827) (Project 7717, Task 771706). The Air Force's use of selection and classification test instruments for officer personnel started early in World War II with the development and use of the Aviation Cadet Qualifying Test and the Aircrew Classification Batteries. Current officer testing programs developed from research on the aircrew batteries and from a second line of research with the Aviation-Cadet Officer-Candidate Qualifying Test which began in 1949. This report gives a resume of the officer selection and classification programs from 1941 to 1961, and describes the various test instruments in terms of their content and use.
- 264      Valentine, L.D., Jr. Development of the Air Force Precommission Screening Test-62. October 1961. (ASD-TN-61-146, ASTIA Document AD-269 527) (Project 7717, Task 771706) (OTS). The 1962 revision of the Air Force Precommission Screening Test replaces an earlier form for screening of applicants for navigator training and selection of airmen for the Air Force Academy Preparatory School. Sections of the test were constructed as short equivalent forms of 5 parts of the Air Force Officer Qualifying Test: verbal, quantitative, general science, mechanic, and scale reading. Results of a tryout with a high-aptitude sample of basic airmen demonstrated a suitable distribution of scores and high correlations between corresponding parts of the new test and AFOQT.
- 265      Harding, F.D. & Bottenberg, R.A. Contribution of status factors to relationships between airmen's attitudes and job performance. November 1961. (ASD-TN-61-147, ASTIA Document AD-272 050) (Project 7719, Task 771902). Previous investigation has shown little relationship between self-report measures of an airman's attitudes (morale) and his rated job proficiency. The data of one such study were reanalyzed by a multiple regression technique to determine whether military status variables (military rank, length of service, kind of duty) affect correlation of attitude measures with proficiency ratings. The addition of such variables to the attitude variables contributed significantly to prediction of supervisors' ratings of proficiency, but the attitude variables did not significantly increase prediction from the status variables alone. The findings show the importance of considering personal and situational factors when evaluating effects of attitude and morale.
- 266      Holdrege, F.E., Lawrence, H.G., Kagihara, R.H., et al. Iterative item analysis. December 1961. (ASD-TN-61-148, ASTIA Document AD-279 555) (Project 7719, Task 771902) (OTS). A method of weighting individual items which uses part correlation coefficients to obtain maximum test-criterion correlation has been proposed. A simple method for graphical solution of the formula for a part correlation coefficient is presented to make the proposed system of iterative item analysis feasible without the use of an electronic computer. By continuing the iterative procedure, this technique produces a result comparable to that obtained from standard iterative multiple regression techniques. The technique was applied to a practical item selection problem and demonstrated improved prediction over a single empirical key. Further studies could determine applicability to other item types and the limits of effective iteration.
- 267      Taylor, C.W., Smith, W.R., Chaudin, B., et al. Explorations in the measurement and prediction of contributions of one sample of scientists. April 1961 (ASD-TN-61-96, ASTIA Document AD-267 832) (Project 7717, Task 771710, Contract AF 41(657)158, University of Utah) (OTS). Physical scientists at 2 Air Force research centers were intensively interviewed concerning the nature of

scientific productivity and the characteristics of effective scientists. Based on these interview suggestions, data were collected on 52 criteria. These were reduced analytically to 14 factor scores. Several tests and questionnaires were developed for tryout as predictors. Scores from these and previously developed instruments that showed promise were correlated with the factor scores and 3 of the original criteria. The most predictable criteria (in terms of number of significant correlations) were ratings of likeableness as a member of a research team, membership in professional societies, organizational status, rated work output, supervisory ratings on overall performance, and peer rankings on overall productivity. The instruments that had scores correlating with the greatest number of criteria were a biographical data questionnaire, self-ratings, and a questionnaire designed to measure minimum level of aspiration. The outcomes of this investigation were identification of a wide variety of measurable criteria and a number of self-report instruments suitable for longitudinal followup and validation as a means of identifying kinds of scientific talent needed by the Air Force.

- 268      Tupes, E.C. & Christal, R.E. Recurrent personality factors based on trait ratings. May 1961. (ASD-TR-61-97, ASTIA Document AD-267 778) (Project 7717, Task 17110) (OTS). Inter-correlations among ratings on 35 personality traits, selected as representative of the personality domain, were obtained for 8 samples. These samples differed in length of acquaintanceship from 3 days to more than a year; in kind of acquaintanceship from assessment programs in a military training course to a fraternity house situation; in type of subject from airmen with only a high school education to male and female undergraduate students to first-year graduate students; and in type of rater from very naive persons to clinical psychologists and psychiatrists with years of experience in the evaluation of personality. Centroid or multiple-group factors were extracted and rotated orthogonally to simple structure. For one study, an independent solution was obtained in which analytic rotations were accomplished on an IBM 650 computer using Kaiser's normal varimax criterion. 5 fairly strong and recurrent factors emerged from each analysis, labeled as (1) Surgency, (2) Agreeableness, (3) Dependability, (4) Emotional Stability, and (5) Culture.
- 269      Wherry, R.J., Stander, N., Leight, Janet, et al. General on-the-job criteria of airman effectiveness: applied to three career fields. June 1961. (ASD-TR-61-98, ASTIA Document AD-269 670) (Project 7717, Task 17154; Contract AF 41(657)270, The Ohio State University Research Foundation) (OTS). This report describes the development and analysis of experimental criteria for evaluating job performance. 3 criterion measures were constructed and administered to airmen selected from 3 areas which correspond to 3 aptitude groups defined by Air Force classification tests. Each of the instruments was subjected to a factor analysis; the resulting factor scores, in combination with test scores and performance ratings, were also factor analyzed. 6 factors were identified, with each factor defined by at least 2 of the major variables. Short forms of 2 of the criterion instruments were prepared for further use. The results suggest suitability of these scales across the 3 job areas.
- 270      Davis, F.B. Measurement of mental skills employed in arithmetic reasoning tests. August 1961. (ASD-TR-61-99, ASTIA Document AD-266 864) (Project 7717, Task 87002; Contract AF 41(657)232, Test Research Service) (OTS). Arithmetic reasoning items are widely used in Air Force personnel selection tests because of their high reliability and validity for a wide range of performance criteria. With the objective of finding test items that measure the same abilities, but require less testing time, 9 types of replacement items were tried out in combination with a set of arithmetic reasoning items. The best combination of new items did measure the same abilities, but with no saving in testing time. Statistical analysis of data for the new tests and Arithmetic Reasoning provides information about the mental skills employed in solving arithmetic reasoning problems.
- 271      Madden, J.M. The method and foundations of job evaluation in the United States Air Force. (With appendix, Annotated bibliography of job evaluation, by M. Joyce Georgia & J.M. Madden) October 1961. (ASD-TR-61-100, ASTIA Document AD-271 372) (Project 7734, Task 773402) (OTS). This report summarizes the history of job evaluation and gives a critical review of the technical literature as a background for the Air Force job evaluation plan. The Air Force plan is described with the rationale for each phase. A discussion of unsolved problems includes an outline of research needed to discover solutions of these problems. An Appendix lists a 200-item bibliography with abstracts.

PERSONNEL RESEARCH LABORATORY (PRL) SERIES  
January 1962--July 1964

- 272 Mullins, C.J. & Groves, K.J. A preliminary attempt to identify officers with scientific and engineering potential. January 1962. (PRL-TDR-62-1, ASTIA Document AD-280 461) (Project 6755, Task 675504) (OTS). As part of an overall attempt to identify young officers who are good prospects for research and development work, this study investigates predictors of ratings and grades achieved by student officers attending the Squadron Officer School. Predictors included American Council on Education examinations, Educational Test Service tests, 11 variables descriptive of educational background, and 9 scores derived from 3 experimental questionnaires. Criteria were a composite school grade and instructor ratings of officership, originality and creativeness, and logical reasoning. Multiple regression analyses revealed that prediction of all criteria except the logical reasoning rating were slightly improved by adding the self-report variables to the academic predictors. Relative merits of the various predictors are considered, both as predictors of the school criteria and as possible predictors of R & D proficiency criteria.
- 273 Morsh, J.E. Job analysis bibliography. March 1962. (PRL-TDR-62-2, ASTIA Document AD-278 708) (Project 7734, Task 773401) (OTS). The bibliography lists 1500 titles appearing between 1911 and 1961. It is especially comprehensive in its coverage of papers, both published and unpublished, issued by Department of Defense agencies and their contractors. Entries are indexed by subject.
- 274 Humphreys, L.G. Stability of airman classification test scores. March 1962. (PRL-TDR-62-3, ASTIA Document AD-278 669) (Project 7717, Task 771703; Contract AF 41(657)279, University of Illinois) (OTS). Stability of Air Force test scores were examined as one facet of the long-range prediction problem. Data for high school students were obtained on Air Force classification tests from an original test session at midyear of 1958-59 and a retest session one year later. Control groups were formed from students at 3 class levels tested only once. Mean growth in aptitude test scores between control class groups was of the same magnitude as the retest gains except for 2 of the airman tests, Figure Recognition and Clerical Matching. Conversions of Air Force aptitude indexes to World War II AGCT scores show that Mechanical Index scores averaged greater gains from year to year than AGCT, while the Administrative Index showed lower gains than AGCT. Stability coefficients for the individual tests were lower than their reliabilities, but the only appreciable differences were for Biographical Data scores, Figure Recognition, and Clerical Matching. Intercorrelations of tests obtained over the one-year period were not appreciably lower than those obtained without intervening time.
- 275 Norman, W.T. Validation of personality tests as measures of trait-rating factors. April 1962. (PRL-TDR-62-4, ASTIA Document AD-285 184) (Project 7717, Task 771706; Contract AF 41(657)269, University of Michigan) (OTS). As the final phase of a test-development project, 3 forced-choice self-report tests were administered to student groups to develop empirical scales predictive of peer-nomination personality ratings drawn from the same groups. 5 factor scales were developed for each test. For the independent sample of a double cross-validation analysis, all of the scales correlated positively with their criteria. Combined scales for the 3 tests showed usefully high correlations. Multiple regression analyses demonstrated that scores from other personality tests administered to the students did not add appreciably to prediction of the peer nomination scores. The self-report tests yield better prediction (.38 - .47) of 3 of the peer-nomination factors (Extraversion, Conscientiousness, Culture) than of Agreeableness (.31, .34) or Emotional Stability (.26, .29). From a second administration of the self-report tests with instructions to fake responses favorable for acceptance for officer training, detection keys were derived that identified a high percentage of faked performance, and factor scales were developed which reduced the occurrence of faked scores in the extremes of the distributions.
- 276 Gordon, Mary Agnes & Bottenberg, R.A. Prediction of unfavorable discharge by separate educational levels. April 1962. (PRL-TDR-62-5, ASTIA Document AD-284 302) (Project 7719, Task 771902) (OTS). Many men meet enlistment standards, but nevertheless are discharged for unsuitability or failure to advance. A more precise means of identifying men most likely to succeed in the Air Force is needed. This study tests the hypothesis that different combinations of tests might be

needed for men with little schooling than for those at a higher level of education. Multiple regression analyses of the data for 2 large samples of airmen showed little gain in accuracy of prediction by separate composites for 3 educational levels. Of the individual predictors of Air Force success, amount of education proved the most valid, further justifying the Air Force in limiting recruitment to high school graduates.

- 277 Dailey, J.T., Shaycoft, Marion F., & Orr, D.B. Calibration of Air Force selection tests to Project TALENT norms. May 1962. (PRL-TDR-62-6, ASTIA Document AD-285 185) (Project 7717, Task 771705; Contract AF 41(657)324, American Institute for Research) (OTS). To tie in norms for Air Force personnel tests with the full range of talent in the recruitment population, the Project TALENT test battery was given to a sample of basic airmen. The sample was split into halves, each numbering over 1200 airmen. By multiple regression techniques, applied separately to each half sample, composites of TALENT tests were selected to predict scores on each of 27 Air Force tests. Close agreement between the 2 samples on tests selected and regression weights derived gives confidence in the results. Tables were prepared of equivalent scores between each Air Force test and the best composite of TALENT tests.
- 278 Edwards, Dorothy S. & Hahn, C.P. Development of Airman Qualifying Examination-62. May 1962. (PRL-TDR-62-7, ASTIA Document AD-284 775) (Project 7717, Task 771705; Contract AF 41(657)381, American Institute for Research). This report describes the development and standardization of the 1962 form of the Airman Qualifying Examination (AQE-62) for use in the selective recruitment program. It was designed to parallel the AQE-F, its immediate predecessor, except that an unspeeded arithmetic test was substituted for 2 speeded tests to avoid difficulties in field administration of speeded tests. The AQE-62 and other airman selection and classification tests were administered to nearly 2500 basic airmen. Percentile scores for the aptitude indexes (Mechanical, Administrative, General, Electronics) were determined by the method of equipercentile conversion. The AQE-62 aptitude indexes correlated with the AQE-F indexes around .80, and the pattern of intercorrelations for the 2 forms was similar, indicating that the new form closely parallels its predecessor.
- 279 Harding, F.D. & Bottenberg, R.A. Attitudes and career intentions of Officer Training School students. May 1962. (PRL-TDR-62-8, ASTIA Document AD-289 872) (Project 7719, Task 771902) (OTS). Questionnaire responses indicating attitudes of students toward an Air Force career were analyzed for 12 Officer Training School (OTS) classes. Results indicate that about 35% of the students plan to make a career of the Air Force. The chief reasons for applying for OTS were identified as prestige and status of being an Air Force officer and the opportunities for travel and additional education. Using responses to selected items of the questionnaire which could become available at the time the candidate applies for OTS, it was possible to develop a Retainability Score which was highly indicative of the OTS graduate's intent to make the Air Force a career.
- 280 Fruchter, B. Prediction of airman success from responses to items of the Kelley Activity Preference Report. June 1962. (PRL-TDR-62-9, ASTIA Document AD-289 820) (Project 7719, Task 771902; Contract AF 41(657)412, Service Bureau Corporation) (OTS). Items from a self-report inventory of personal background and activity preferences were selected by various methods and combined to predict successful completion of first-term enlistment. 2 samples of airmen (2000 each) were used, each divided into a success group and a nonsuccess group for item analysis and validation purposes. Selection and weighting of valid items was determined on the initial sample, the scoring procedures were cross validated on the second sample. Although optimal item weighting produced higher validity with the initial sample, unit weighting of the most valid items proved as effective in cross validation.
- 281 Lecznar, W.B. Some aptitude data on Air Force enlisted accessions. June 1962. (PRL-TDR-62-10, ASTIA Document AD-289 874) (Project 7717, Task 771705). The Air Force uses information about the aptitudes of recruits in selecting and assigning enlistees. This report summarizes the data about enlistments during the past 6 years in terms of scores on Air Force tests. From year to year the trend in average scores has been upward, but with consistent cycles within each year in terms of monthly averages. Limited data on civilian means for Air Force tests and airman means



the Project TALENT tests yield some comparisons of Air Force talent with the general male population of high school seniors.

- 282 Vanasek, F.J. Importance of situational factors in the measurement of officers effectiveness. With an Appendix by R.A. Bottenberg. July 1962. (PRL-TDR-62-11, ASTIA Document AD-289 873) (Project 7717, Task 771701) (OTS). The Officer Effectiveness Report is an important instrument in management of officer personnel. If factors not related to job performance affect the ratings, their influence should be taken into account. This study investigates the extent to which officer specialty, command assignment, and military grade affect distribution and reliability of effectiveness ratings. By applying multiple linear regression and analysis of variance techniques to ratings of 1500 Air Force officers, variance of ratings was apportioned between performance and nonperformance factors. When the effects of the 3 nonperformance factors were removed, the reliability of the ratings was lowered, but relevance to differences in job performance was increased. The influence of military grade on effectiveness ratings is greatest of the 3 situational factors, but all contribute significantly. It is assumed that the relationships come about through a number of influences, including systematic selection for mission, assignment, and promotion.
- 283 Brokaw, L.D. Prediction of technical school success from homogeneous biographical inventory scores. July 1962. (PRL-TDR-62-12, ASTIA Document AD-289 877) (Project 7717, Task 771705) (OTS). A personal questionnaire, the Biographical Inventory, was part of the airman classification batteries up to 1959, with separate groups of items keyed for different job areas. This paper reports how the items of the most recent classification battery were assorted into 15 clusters on the basis of high correlations among items of each cluster. The scores for each group (homogeneous keys) were correlated with success in training for graduates of 8 Air Force training schools. The keys for Economic Level and Educational Success were the most generally valid. By multiple regression techniques, it was found that prediction of training school grades was almost as good from a regression equation based on graduates from all 8 schools as from separate equations for schools in each job area. Composite scores combining the inventory scores and the aptitude index were significantly more valid than the aptitude indexes alone (average .43 vs .46); but a simplified combination including only the most valid inventory keys with the aptitude index proved equally valid. Under conditions of this study, a short combination of the most valid scales would add significantly to the validity of aptitude indexes derived from the last Airman Classification Battery.
- 284 Holérege, F.E. OSCAR: Optimum selection, classification, and assignment of recruits. July 1962. (PRL-TDR-62-13, ASTIA Document AD-285 186) (Project 7719, Task 771901) (OTS). 3 mathematical models, adaptable for electronic processing machines, are described in nontechnical terms and illustrated by applications to personnel procurement and assignment problems. Emphasis is on capability for providing management with meaningful information for controlling a complex personnel system.
- 285 Gordon, Mary Agnes & Flyer, E.S. Predicted success of low-aptitude airmen. August 1962. (PRL-TDR-62-14, ASTIA Document AD-290 545) (Project 7719, Task 771902) (OTS). This study examines the performance characteristics of a group of low-aptitude airmen who entered the Air Force during the first 6 months of 1956 and who either completed successfully a 4-year enlistment or were discharged for unsuitability or nonadvancement. It was found that a brief composite of aptitude tests and preservice educational level differentiated the successes from the failures quite well. When it is necessary to recruit from low-aptitude airmen, the additional screening would select those most likely to be of value to the Air Force.
- 286 Hook, Marion E. & Massar, R.S. Rankorder estimates of the time required for crosstraining among 98 airman specialties. August 1962. (PRL-TDR-62-15, ASTIA Document AD-209 551) (Project 7734, Task 773403) (OTS). When data based on experience are not available, it is often possible to obtain estimates of the relative time required to crosstrain personnel qualified in one specialty to equal proficiency in a second specialty. This paper reports the first study on devising efficient methods for collecting and analyzing such estimates. A procedure was developed for collecting data to form a matrix describing the relative crosstraining-time demands for movements among a group of specialties. Rankorder estimates of the crosstraining-time requirements for the

9506 movements possible among the 98 5-level specialties were obtained from 477 Command and Staff College student officers. A computer program for hierarchical grouping was applied to these data to cluster specialties into groups such that crosstraining time between specialties within groups is minimized. Mean crosstraining-time estimates were computed at each stage of the clustering procedure as a criterion for evaluating the cost of reducing the number of clusters. For illustrative purposes, the hierarchical structure at the 40-cluster stage is compared with the 40 career-field designations of the 98 specialties.

- 287     Lichtenstein, S. & Hahn, C.P. Feasibility of identifying predictors of success in officer jobs from personnel records and the word picture section of effectiveness reports. August 1962. (PRL-TDR-62-16, ASTIA Document AD-295 049) (Project 7734, Task 773404; AF 41(657)352, American Institute for Research) (OTS). To increase the amount of information that can be used in determining desirable job requirements and in evaluating officer performance, 2 sources were examined for pertinent and scalable variables. From personnel records of officers in the Communications Specialty and the Research & Development career area, 76 variables were identified and scaled. By developing a method for content analysis, information from the Word Picture section of the Officer Effectiveness Reports for the same officers was quantified on 89 scales. Individual data records, score distributions, and intercorrelations of 165 variables for the 2 samples are available for use in developing qualifications and criteria for jobs in these areas.
- 288     Merck, J.W. Retention of first enlistment airmen: Analysis of results of a mathematical simulation. August 1962. (PRL-TDR-62-17, ASTIA Document AD-292 951) (Project 7719, Task 771901) (OTS). This report describes a computerized mathematical model to simulate part of the Air Force personnel system as a source of information for determining recruitment policies. The report focuses on the general form of the problem, the model, and the nature and limitations of the empirical data used. Substantive results, based on recruits for the first half of 1956, are largely byproducts of the data reduction required to obtain the probabilities and distributions used in the model. Contrasting retention data for 2 of the 100 airman groups illustrate potential use of the information in developing tables of expected service life.
- 289     Harding, F.D., Hottenberg, R.A., & Downey, R.L., Jr. Prediction of retirement of Air Force officers. August 1962. (PRL-TDR-62-18, ASTIA Document AD-290 550) (Project 6755, Task 675505). Personal data such as age, family status, rate of promotion, type of duty, and educational achievement were used to predict whether officers of the Air Force Systems Command were retired or on active duty. Regression analyses were computed for a sample of regular officers to predict voluntary retirement, and for a sample of reserve officers to predict both voluntary and involuntary retirement. Prediction of reserve officer involuntary retirement was highest ( $R^2 = .55$ ) with time in grade the most significant predictor. Prediction of voluntary retirement was less accurate (regular officers,  $R^2 = .32$ ; reserve officers,  $R^2 = .15$ ) with time in grade again the important predictor. For regular officers, flying status and time since last foreign service added significantly to prediction. A Retirement-Potential Score was developed to illustrate use of the data. As information of this kind is expanded and verified on other samples, it will aid in planning replacement of personnel losses.
- 290     Gragg, D.E. An occupational survey of an airman career ladder: Supply Warehousing-Inspection. September, 1962. (PRL-TDR-62-19, ASTIA Document AD-292 949) (Project 7734, Task 773401). The job inventory is the Air Force instrument for securing information about current Air Force jobs. This report describes development of one job inventory, listing 162 tasks, and its use in conducting a survey of 772 airmen in 4 specialties of one career ladder. Incumbents provided information about whether they performed each task and the relative time spent on the task. Results are summarized by specialty for each task as proportion of incumbents performing the task and mean proportion of time spent on the task. The results show the extent to which men in different specialties of this career ladder are performing the same tasks and provide a basis for judging the accuracy of job descriptions and the validity of specialty breakdowns. Write-ins that incumbents added to the inventory list identified additional tasks to include in the revision prepared for Air Force use, the final outcome of this survey.

- 291 Judy, C.J. Contribution of education to the rated effectiveness of officers in scientific and engineering assignments. September 1962. (PRL-TDR-62-20, ASTIA Document AD-290 546) (Project 6755, Task 675502) (OTS). Data on a sample of officers in scientific and engineering assignments were used to evaluate the role of selected educational variables as predictors of effectiveness ratings. Results, based on the solution of a series of multiple regression problems and the computation of mean effectiveness scores for subgroups of officers with different characteristics, show that variance in the ratings can be partially explained in terms of educational information on the rates. Educational data compare favorably with data from the military record as information which can be used to foretell effectiveness scores. Data on educational level, rather than data on the completion of a designated college curriculum, are the aspects of educational information which generally serve to identify officers who will receive the higher effectiveness ratings.
- 292 Mullins, C.J. Comparison of Instructor Aptitude Test scores and General Aptitude Indexes achieved by a sample of basic airmen. September 1962. (PRL-TDR-62-21, ASTIA Document AD-290 547) (Project 7717, Task 771705). The Instructor Aptitude Test, which was designed to screen applicants for instructor positions in the Air Training Command, has previously demonstrated validity for success in the technical instructor training schools. This report considers the possibility that the General Aptitude Index may be a practical substitute for the Instructor Aptitude Test. It gives intercorrelations of part scores on the Instructor Aptitude Test and the 4 aptitude indexes derived from the Airman Qualifying Examination for a large sample of basic airmen, showing that the General Aptitude Index is highly correlated with the Instructor Aptitude Test. Tables give equivalent scores on the 2 measures and expected percentages that would achieve a given IAT score for each General AI level. This information makes it possible to screen airmen for instructor training on aptitude information available for all airmen.
- 293 Ford, F.B. A technique for the evaluation of recruiting strategy with fluctuating availability and known demand. September 1962. (PRL-TDR-62-22, ASTIA Document AD-294 848) (Project 7719, Task 771901) (OTS). Large organizations, such as the armed services, have a fairly constant requirement for new personnel, but availability of recruits varies from month to month. It is proposed that manpower needs be met by exceeding quotas at times of high availability of qualified applicants and holding surpluses inactive until needed. A special case of the general linear programming model, the "transportation problem," provides a computer technique for determining the optimal scheduling of overages and holding times to keep holding costs at a minimum. Different arbitrary estimates of holding costs applied to a series of problems demonstrate the importance of accurate cost estimates. Procedures for continuing improvement of input data are suggested.
- 294 Humphreys, L.G. Hierarchical factors in course grades in an aviation high school. October 1962. (PRL-TDR-62-23, ASTIA Document AD-294 814) (Project 7719, Task 771905; Contract AF 41(657)279, University of Illinois) (OTS). Factor scores of high school grades were needed for use in a later study of the relationship of Air Force aptitude tests to high school achievement. Separate hierarchical analyses were made for course grades in the technical curriculum and in the mechanical curriculum. A large general factor characterized both solutions, probably reflecting general academic ability. Other factors displayed the expected subject-matter groupings, the most significant a clear-cut shop factor which appeared in both analyses.
- 295 Tupes, E.C. Correction of correlation with a dichotomous variable for restriction in range. December 1962. (PRL-TDR-62-24, ASTIA Document AD-299 512) (Project 7717, Task 771705). In evaluating tests proposed for screening recruits, it is necessary to estimate correlations for a full range of scores with some Air Force criterion of success from correlations based on the selected group. A method is presented for estimating the correlation for the full-range population from distributions of scores for the successful and unsuccessful groups of the selected sample. The method requires only the assumptions made for the standard formulas used to correct correlation coefficients for restriction of range when both variables are continuous. It is suitable whenever the criterion is a dichotomy, whether restriction is due to direct or to indirect selection.

- 296 Tomlinson, Helen & Elson, Jo Ann (Eds.) Abstract of personnel research reports: I. 1954-1957. December 1962. (PRL-TDR-62-25, ASTIA Document AD-296 936) (OTS). Abstracts are assembled of 145 technical documentary reports issued by the Air Force's personnel research laboratory from January 1954 through December 1957. They cover research projects in selection, classification, and utilization of Air Force personnel. The reports are indexed by personal author, corporate author, and ARDC project number.
- 297 Tomlinson, Helen & Elson, Jo Ann (Eds.) Abstracts of personnel research reports: II. 1958-1961. December 1962. (PRL-TDR-62-26, ASTIA Document AD-296 937) (OTS). Abstracts are assembled of 126 technical documentary reports issued by the Air Force's personnel research laboratory from January 1958 through December 1961. They cover research projects in selection, classification, and utilization of Air Force personnel. The reports are indexed by personal author, corporate author, and project number.
- 298 Elson, Jo Ann (Ed.) Abstracts of personnel research reports: III. 1962. December 1962. (PRL-TDR-62-27, ASTIA Document AD-299 513) (OTS). This volume includes abstracts of the 27 technical documentary reports issued by the 6570th Personnel Research Laboratory in 1962. They cover studies in selection, classification, and utilization of Air Force personnel; systematizing information flow in support of personnel planning; methods of describing, evaluating, and structuring Air Force jobs; and development of procedures for improving the quality of Air Force personnel.
- 299 Zimmer, C.E. Chance distribution of inconsistent response patterns in paired comparison and multiple ranking designs. January 1963. (PRL-TDR-63-1, DDC Document AD-401 405) (Project 7719, Task 771901) (OTS). Comparative judgements are used in developing scales for various personnel and occupational criteria. In scaling data from paired comparisons, frequency of inconsistent responses is crucial. To determine whether information from the simpler and more economical multiple ranking design can be evaluated by the same techniques as for a complete paired comparison design, computer programs were adapted whereby the full population of possible response patterns could be randomly sampled to determine the chance distribution of inconsistent responses for both designs. Results for the 1000 randomly selected patterns showed that the multiple rank order design restricts the possible number of response patterns and reduces the frequency of inconsistent patterns. The distributions were so different that techniques devised for testing significance of extreme frequencies for data from the classic paired comparison design are inappropriate for evaluating extreme occurrences in multiple ranking data. Since the multiple ranking distribution approximates the normal distribution, it would be suitable to evaluate empirical data by comparison with the parameters here determined for the random sample of the full population of response patterns.
- 300 Madden, J.M. & Bourdon, R.D. Effects on judgment of variations in rating scale format. January 1963. (PRL-TDR-63-2, DDC Document AD-401 406) (Project 7734, Task 773402). The purpose of this study was to determine whether mean job evaluation ratings would differ as a function of 7 variations in rating scale format. 60 basic airmen rated 15 occupations on 9 job requirement factors for each format. A 3-way analysis of variance (jobs, factors, scale format) resulted in statistically significant terms for each of the main effects and for all 4 interaction terms. It was concluded that rating scale format was a determiner of the judgment of raters in this sample and that selection of an optimal format should be based upon capability to predict a criterion.
- 301 Christal, R.E. JAN: A technique for analyzing group judgment. February 1963. (PRL-TDR-63-3, DDC Document AD-403 813) (Project 7734). This paper indicates how a technique which clusters criteria in terms of the homogeneity of their prediction equations can be used to identify and describe the rating policies within a group or board of judges. The technique measures the consistency of ratings obtained from individual judges, and indicates the amount and nature of agreement between judges or groups of judges. A practical method is suggested for helping a board or committee to reach a consensus concerning how relevant factors shall be weighted in future situations so as to carry out its final joint policy. Examples are given to show how the technique can be used to determine the composition of a service school selection composite, to determine factor weights for a job evaluation plan, and to determine how relevant factors should be combined into a job-oriented criterion composite.

- 302 Fruchter, Dorothy A. Development of Airman Classification Test-1963. February 1963. (PRL-TDR-63-4, DDC Document AD-404 039) (Project 7717, Task 771705; Contract AF 41(657)396, Psychological Research Service, Inc.). The Airman Classification Test is used for all airman classification programs except selective enlistment. It is a 4-hour test composed of 8 subtests from which 4 aptitude indexes are derived: Mechanical, Administrative, General, and Electronics. It may be scored either by machine or by hand. The 1963 form was developed to yield scores equivalent to those from the preceding form. Modifications in both content and format simplify administration and scoring. The item statistics presented suggest that the new form may be slightly easier, but more reliable, than its predecessor.
- 303 Lecznar, W.B. Survey of tests used in airman classification. February 1963. (PRL-TDR-63-5, DDC Document AD-403 831) (Project 7717, Task 771705) (OTS). Aptitude tests have been used since 1948 to aid in selecting and assigning enlistees to the training for which they are best suited by ability and education. By this means the Air Force seeks to reduce the cost of training and realize competent, well-satisfied career airmen. This survey traces the history of airman aptitude testing, tells how effective tests are identified, how the tests are assembled, and how the scores are used. The present Airman Qualifying Examination is described and compared with other aptitude test batteries. The role of research in seeking out more effective techniques of personnel selection and assignment is emphasized, with illustrations from ongoing studies.
- 304 Bottenberg, R.A. & Ward, J.H., Jr. Applied multiple linear regression. March 1963. (PRL-TDR-63-6, DDC Document AD-413 128) (Project 7719, Task 771901) (OTS). This volume develops the application of multiple linear regression as a general approach to the formulation and analysis of research problems. The approach, while powerful, is direct and conceptually simple, less restrictive than multivariate correlation techniques, and suited to problems involving binary-coded information. Illustrative problems are largely from the behavioral sciences. The chapters cover: introduction to vectors, formulation of problems with categorical and continuous predictors, generation of new vectors, treatment effects obtained in presence of concomitant variables, and other applications of the general regression approach.
- 305 Neel, G.I. Estimation of probabilities associated with the  $F$  statistic by digital computer techniques. March 1963. (PRL-TDR-63-7, DDC Document AD-413 950) (Project 7719, Task 771901) (OTS). The  $F$  statistic is widely used to test the significance of experimental results in the behavioral sciences. Tabulations of probabilities for  $F$  values are available only for a few selected significance levels and degrees of freedom. This paper presents an efficient method for programming computation of the estimated probability for any specific  $F$  value. Probabilities are accurate to 4 decimal places and degrees of freedom may range from 4 to 1000.
- 306 Fruchter, B., Morin, R.E., & Archer, W.B. Efficiency of the open-ended inventory in eliciting task statements from job incumbents. March 1963. (PRL-TDR-63-8, DDC Document AD-418 980) (Project 7734, Task 773401; Contract AF 41(657)274, The University of Texas) (OTS). Checklists of tasks included in an Air Force specialty are used to collect job information from incumbents, with provision for them to write in tasks they perform which are not listed. This study investigated methods of selecting incumbents and presenting the checklist to produce the most complete and accurate task inventory. Incumbents of 4 AFSC's (Ground Radio Operator, Automotive Repairman, Aircraft Hydraulic Repairman, Accounting & Finance Specialist) were selected to be representative of commands and geographic location. Portions of the samples were given inventory forms that intentionally omitted some tasks known to be part of the job. From a tally of write-ins, rate of retrieval of omitted tasks and expected production of new task statements were computed for 3 sample sizes (20, 40, 60) within each AFSC. By extrapolating curves fitted to the data, it was estimated that samples of 100 incumbents would yield 85% of the task statements produced by the full sample (360). About 25% wrote in no additional tasks, 50% no more than 3, and only rare individuals over 20. Multiple regression analyses revealed no effective combination of predictors to identify productive individuals. Aircraft Hydraulic Repairmen produced the least, Accounting & Finance Specialists the most new statements. Expanded task inventories were completed by a second sampling of incumbents who rated each task they performed for time required, frequency of performance, and training and experience required. Another series of multiple regression analyses showed that only the number who reported performing a task was highly related to likelihood of a task being written in.

- 307 **Harding, F.D., Downey, R.L., Jr., & Bottenberg, R.A. Career experiences of AFIT classes of 1955 and 1956. April 1963. (PRL-TDR-63-9, DDC Document AD-403 830) (Project 6755, Task 675501) (OTS).** To determine the utilization, attitudes, and retainability of officers who participate in AFIT programs, a questionnaire survey was made of the 1955 and 1956 classes. Returns from 82% of the 1380 officers still in service and 62% of the 387 who had left it provided information about training, career experience, and attitude toward the Air Force. Responses showed that those apt to remain in service were older, married, regular officers. Younger officers who were ROTC graduates assigned to engineering and scientific fields were likely to leave the service. Most frequent reasons given in leaving the Air Force were: promotions not based on merit, better civilian job opportunities, low pay, and unsettled family life. In-service officers' reasons for remaining were retirement advantages and amount of time already invested. They might decide to leave for a high-paying civilian job, loss of flight pay, or missing out on promotion. Nonmonetary aspects of the work situation were important determiners of job satisfaction. A Retention Potential Score, using information available before AFIT assignment, applied as a screening device would appreciably increase the retention of AFIT graduates.
- 308 **Tupes, E.C. Relationships between attendance at Squadron Officer School and later Officer Effectiveness Reports. April 1963. (PRL-TDR-63-10, DDC Document AD-404 187) (Project 7719, Task 771904) (OTS).** Two questions of interest to the staff of the Air Force Squadron Officer School were investigated. The first question asked whether attendance at Squadron Officer School resulted in an increase in officer effectiveness, and the second asked whether those officers who achieved the higher grades in Squadron Officer School were more effective in their subsequent career than officers achieving lower grades. The criteria of effectiveness were Officer Effectiveness Reports (OERs) completed on each officer in the 2 years immediately following Squadron Officer School. Results of a series of multiple regression analyses indicated that, when other factors associated with OERs were taken into consideration, no differences were found which could be attributed to either attendance or nonattendance at Squadron Officer School, nor to performance during Squadron Officer School. An appendix presents a nontechnical discussion of the method of multiple linear regression.
- 309 **Brokaw, L.D. Prediction of success in technical training from self-report information on educational achievement. April 1963. (PRL-TDR-63-11, DDC Document AD-414 888) (Project 7717, Task 771705) (OTS).** Educational information about recruits was evaluated for its potential contribution to airman classification. A self-report biographical inventory provided 53 education variables from the responses to 16 questions. Multiple regression analysis for graduates from 8 technical schools (samples from 267 to 820) showed that prediction of technical school success improved significantly when education variables were combined with the aptitude index. The education information is valid alone, as well as in combination with the aptitude measure, for use in airman selection.
- 310 **Madden, J. M. Officer job evaluation in terms of merited pay versus merited grade. May 1963. (PRL-TDR-63-12, DDC Document AD-417 277) (Project 7734, Task 773402) (OTS).** Descriptions for 144 officer jobs were ranked by captains and majors attending the Air Force Command & Staff College. These rankings were accomplished along 2 dimensions, merited grade and merited pay, using an unbalanced, incomplete block design. Significant differences between the 2 sets of rankings were observed. For instance, job descriptions for pilots of conventional aircraft, helicopters, and single engine jets are ranked substantially higher on pay than on grade. This is true to a lesser extent for many scientific, engineering, and medical jobs. Jobs which were rated higher on grade than on pay include many of the directors and a variety of staff jobs. The results indicate that a single job evaluation plan will not be adequate for predicting both pay rankings and grade rankings.
- 311 **Madden, J.M. Prediction of officer job rankings from ratings on two sets of job evaluation factors. May 1963. (PRL-TDR-63-13, DDC Document AD-417 276) (Project 7734, Task 773402) (OTS).** Rank orderings of 144 officer job descriptions made on the basis of merited pay in one case and merited grade in the other were used as criteria to validate 2 sets of job requirement factors, using a multiple regression technique. An experimental set of 10 factors predicted both criteria better than the set of 10 factors currently used by the Air Force in job evaluation. A variable which reflected the organizational level of the job increased predictive efficiency. Both sets of factors were more predictive of pay rank than of grade rank. It was suggested that some combination of both sets of factors might prove better than either one.

- 312 Madden, J.M. A preliminary study of officer job evaluation factors. May 1963. (PRL-TDR-63-14, DDC Document AD-417 456) (Project 7734, Task 773402) (OTS). A criterion was developed for validating proposed job requirement factors by pair-comparison scaling of 31 officer specialties. Comparisons were collected by a multiple rank-order design from 471 Command & Staff College student officers. 10 job requirement factors were validated against the criterion, using ratings of each factor on a 9-point scale for the 31 jobs, collected from 45 student officers. The resulting multiple regression equation predicted the criterion scale values almost perfectly ( $R^2 = .96$ ), with only 5 factors receiving significant positive weights: Formal Education; Special Training & Experience; Originality, Ingenuity, & Creativeness; Decision Making; Planning. The role of management in developing a job evaluation plan is discussed.
- 313 Madden, J.M. An application to job evaluation of a policy-capturing model for analyzing individual and group judgment. May 1963. (PRL-TDR-63-15, DDC Document AD-417 273) (Project 7734, Task 773402). A major problem in developing a job evaluation plan is the estimation of individual rater consistency and degree of interrater agreement. A method for making these estimations is proposed which combines a multiple regression model with a mathematical grouping model in quantifying a measure of predictive efficiency. Officers ranked 50 simulated Air Force specialties, each of which consisted of pre-assigned scale values for 10 job requirement factors. 38 officers ranked the jobs on the basis of merited grade, 36 on merited pay. Each rater's consistency was evaluated by a multiple regression equation predicting his rank-ordering of the jobs from the factor values. Consistency of policy among raters was measured by the loss in predictive efficiency when a single equation represented the joint policy of the group. Measures of rater consistency showed that all but 2 of the raters were adequately consistent. Measures of interrater agreement indicated that raters were applying a homogeneous policy, whether they ranked on merited pay or merited grade. The officer raters (captains and majors) were capable of applying a consistent policy in evaluating jobs when their only information was an estimate of the job requirements.
- 314 Ward, J.H., Jr. & Davis, Kathleen. Teaching a digital computer to assist in making decisions. June 1963. (PRL-TDR-63-16, DDC Document AD-407 322) (Project 7719, Task 771901). This paper gives a general nontechnical description of a procedure whereby an electronic computer may simulate human judgments. Requirements are a sample of decisions and the information on which those decisions were based. Accuracy of simulation depends on completeness of the input information. The essential procedure is to use the information as predictor variables in a regression equation that best predicts the sample of decisions. Illustrations include application to personnel assignment decisions, to judgments of required cross-training time, and to forecasting effects of policy changes. This procedure can also be used to evaluate the self-consistency of judges and to identify conflicting points of view among policy makers.
- 315 Flyer, E.S. Prediction of unsuitability among first-term airmen from aptitude indexes, high school reference data, and basic training evaluations. June 1963. (PRL-TDR-63-17, DDC Document AD-420 530) (Project 7719, Task 771902) (OTS). Three sets of information are evaluated as predictors of unsatisfactory airman performance as defined by a combination of supervisory ratings and unsuitability discharges: selection and classification variables, basic training performance ratings, and high school reference data. Two 2000-case samples were identified for which predictor and performance criterion data were available after 2 years of service. Multiple regression analysis applied to the data demonstrated that, within the framework of the current selection and classification process, improved predictions of airman performance are obtainable from educational reference data and behavioral evaluations collected during training. It appears possible to evaluate new airmen during their first month of active duty with a fair amount of accuracy in terms of their potential worth to the Air Force.
- 316 Lechner, W.B. & Tupes, E.C. Comparison of Air Force aptitude indexes with corresponding TALENT test composites. July 1963. (PRL-TDR-63-18, DDC Document AD-420 555) (Project 7717, Task 771705) (OTS). Since 1946, Air Force selection tests have been standardized to the World War II draft-eligible population. Nationwide norms for male 18-year-olds and 12th grade students, as of 1960, have been determined for composites of Project TALENT tests selected to correspond to the 4

aptitude indexes derived from the Airman Qualifying Examination (AQE). In this study, 8 airman samples took the AQE and the selected TALENT tests to provide data for distributing scores on AQE that will rank recruits in terms of the full range of talent in the draft-eligible population. These conversion tables make it possible to standardize new tests directly to the 1960 population.

- 317 Marks, M.R. & Hook, Marion E. Development of a standard list of work requirements in airman specialties. August 1963. (PRL-TDR-63-19, DDC Document AD-424 932) (Project 7734, Task 773403; Contract AF 41(657)373, The Matrix Corporation) (OTS). As part of the effort to devise efficient methods for collecting data that permit comparisons among airman specialties, the purpose of this study was to develop a comprehensive standard list of skills, knowledges, aptitudes, personal characteristics, attitudes, and work habits needed for satisfactory job performance. Basic requirements were identified in previous research, airman specialty descriptions, and job training standards. The initial list consists of 250 work requirements, each relevant to at least 3 specialties. Two experimental rating scales were developed for evaluating the requirements for any one specialty. Work requirements and rating scales are defined in a form designed for collecting data from airman job (subject-matter) experts that will reflect differences in training requirements. In a preliminary field test, 7-level airmen in 43 career ladders reported that the standard list satisfactorily covers essential requirements of the 5-level specialties they rated; but their ratings indicate one scale must be revised. Appendixes give a list of 297 requirements identified by other investigators and definitions for each of the 250 work requirements in the standard list developed for airman specialties.
- 318 McReynolds, Jane. Validity of Airman Qualifying Examination, Form F, for technical training grades-1961. August 1963. (PRL-TDR-63-20, DDC Document AD-426 756) (Project 7717, Task 771705) (OTS). Validity of the 4 aptitude indexes derived from the Airman Qualifying Examination, Form F, was determined for final grades in 49 airman training courses. The selected samples graduating in 1961 ranged in size from 30 to 2233 with only 3 courses that had less than 100 graduates. Appropriateness of the selector indexes for their specialty clusters was evidenced by their having the highest validity for all but 2 of the 49 courses. The Electronics AI was the most effective, the Administrative AI the least. 8 figures illustrate graphically the relationship between scores on the aptitude index and success in training. These validation data demonstrate that the Airman Qualifying Examination is an effective instrument for use in assigning enlistees to technical training.
- 319 Archer, W.B. & Fruchter, Dorothy A. The construction, review, and administration of Air Force job inventories. August 1963. (PRL-TDR-63-21, DDC Document AD-426 755) (Project 7734, Task 773401; Contract AF 41(657)397, Psychological Research Service, Inc.) (OTS). This project was directed toward improving procedures for constructing and administering Air Force job inventories, using methods described in the current Occupational Analysis Manual. In constructing inventories for 20 airman career ladders, source materials for duty and task statements were evaluated. Review procedures were compared with respect to yield of information from technical advisors (specialty experts), both from field review and from direct interview. Results of administration of 10 inventories to large samples of incumbents showed that efficient use of source materials and technical advisors yielded practically complete inventories, since incumbents produced only a negligible number of task write-ins. Preliminary analyses of the inventory survey of one career ladder (Medical Laboratory) provided job descriptions for each of the 3 specialties.
- 320 Elson, Jo Ann (Ed.) Abstracts of personnel research reports IV. 1963. December 1963. (PRL-TDR-63-22, DDC Document AD-432 151) (OTS). This volume includes abstracts of the 23 technical documentary reports issued by the 6570th Personnel Research Laboratory in 1963. They cover studies in selection, classification, and utilization of Air Force personnel, systematizing information flow in support of personnel planning, methods of describing, evaluating, and structuring Air Force jobs, and development of procedures for improving the quality of Air Force personnel.
- 321 Sells, S.B. & Mace, D.J. Prediction of Air Force adaptability of basic airmen referred for psychiatric evaluation. September 1963. (PRL-TDR-63-23, DDC Document AD-426 765) (Project 7719, Task 771902; Contract AF 41(657)411, Texas Christian University) (OTS). About 4000 basic airmen are referred to the Mental Hygiene Clinic each year. Less than one fourth of these complete



successful enlistment terms. In this study, data from enlistment records, basic training, and clinic referral were collected and analyzed to identify predictors of success within this psychiatric referral group. Keying 24 items from clinical records resulted in scores which correlated .55 with the criterion of Air Force success. Regression equations were derived to show increased efficiency of prediction from adding the mental hygiene data to other predictors of success. Distributions of the mental hygiene scores illustrate possible use of a cutting score for early identification of mental hygiene referrals not likely to successfully complete an Air Force tour.

- 322 **Madden, J.M., Hazel, J.T., & Bourdon, R.D. Effect of sorting procedure on accuracy of ordinal ranking. January 1964. (PRL-TDR-64-1, DDC Document AD-433 056) (Project 7734, Task 773403) (OTS).** Although ranking is often used by research personnel and by others working in supervisory and management situations, there has been practically no development work done on the method itself. Many techniques for accomplishing rank-ordering are devised, but their efficacy is rarely tested. In an attempt to determine the most effective sorting procedure to arrive at accurate rankings, a task was selected that permitted an objective measure of error. 54 cards were prepared that showed pairs of circles differing in area by graduated amounts. The task was to order the cards by size of difference in circle area. 5 samples of 52 airmen were each directed to sort the cards by one of 5 methods. 4 methods were structured in varying degrees; in the fifth, subjects were free to sort as they pleased. Analysis of variance demonstrated significant differences between methods. The free-sort method yielded the least average error, suggesting that for judgments of the type used in this study, there is no gain in accuracy of ranking from specifying the method of sorting.
- 323 **Lecznar, W.B. Years of education as a predictor of technical training success. With an Appendix by J.W. Bowles & F.B. Ford. February 1964. (PRL-TDR-64-2, DDC Document AD-437 940) (Project 7717, Task 771705) (OTS).** Previous findings on education variables as predictors of airman training and job success are reviewed as background for this new study. The predictive efficiency of years of education was assessed against final grade in 34 courses of technical training. By multiple regression techniques the percentage contributions were determined of education alone, aptitude tests alone, and combinations of aptitude measures and years of education to prediction of final school grade for each of the 34 samples of graduates. These data confirmed previous findings that education alone as a continuous variable was not as good a predictor as aptitude tests alone, and that years of education did not add appreciably to the level of prediction achieved by aptitude tests. Compared to the gains from an optimum combination of aptitude tests for each training criterion, any gain from adding the education variable proved practically unimportant.
- 324 **Lecznar, W.B. Comparison of test items across forms. February 1964. (PRL-TDR-64-3, DDC Document AD-437 953) (Project 7717, Task 771705) (OTS).** Repetitive use of a limited number of the same items in subtests of successive forms of the Airman Classification Test permitted comparison of statistics for these items over time. The difficulty level of each item, measured by percentage of examinees marking the right answer, varied with the general ability of the sample as measured by AFQT score. The precise effects of practice from previous testing on similar kinds of material is unknown, but the results suggest that use of anchor items can yield gross estimates of differences in quality of tested groups. Such estimates can best be made from the Arithmetic Reasoning and Word Knowledge subtests, since spatial visualization and information-type items tended to be more stable across samples.
- 325 **Downey, R.L., Jr., Harding, F.D., & Bottenberg, R.A. Ratings by officer groups of importance and obtainability of selected job characteristics. February 1964. (PRL-TDR-64-4, DDC Document AD-437 954) (Project 6755, Task 675501) (OTS).** To determine how different groups of officers value an Air Force career, 22 possible job rewards were rated by 1300 former AFIT students as to their importance and the possibility of obtaining them as Air Force officers. Responses were analyzed by 4 dichotomous groupings: (a) active duty officers vs those who had resigned or retired, (b) scientific and engineering officers vs nonscientists, (c) young officers vs older officers, and (d) rated vs nonrated officers. Differences in ratings by the paired groups were evaluated by computing an overall chi square for the distributions of each job characteristic. In general, rewards rated as most attainable were rated as least important. Large portions of the ratings differed significantly for 31 of the 176 pairs, indicating that the attitudes and value systems of various groups of officers are different.

- 326 **Flyer, E.S.** Prediction by career field of first term airman performance from selection and basic training variables. March 1964. (PRL-TDR-64-5, DDC Document AD-600 781) (Project 7719, Task 771902) (OTS). To gain information that might be useful in improving airman classification, 29 predictor variables were evaluated by multiple regression techniques against a criterion of satisfactory performance during the first 2 years of enlistment. Variables included personal data, educational and aptitude data, peer ratings, and an instructor evaluation collected during basic training. The criterion was high Airman Performance Rating vs low rating or discharge. Samples were drawn from 15 career fields. Predictive equations were derived for the full population and for each career-field sample. In all but 2 career fields prediction was improved by equations based on the career-field samples, but a full-population equation was judged more immediately useful.
- 327 **Miller, R.E. & Valentine, L.D., Jr.** Development and standardization of the Air Force Officer Qualifying Test-64. March 1964. (PRL-TDR-64-6, DDC Document AD-600 782) (Project 7717, Task 771706) (OTS). A revised form of the Air Force Officer Qualifying Test, AFOQT-64, replaced AFOQT Form G in September 1963. The new form is more easily administered and scored than earlier forms. It contains 542 items organized into 13 subtests. Scores are obtained for the usual AFOQT composites: Pilot, Navigator-Technical, Officer Quality, Verbal, and Quantitative. In addition, the test can be scored for 2 special composites (Academic and Career Potential) constructed for use only in the AFROTC Officer Education Program. Item statistics, reliability estimates, and distribution statistics for the composite scores are reported. The composites were scaled with reference to equivalent Project TALENT composites. Instead of the USAF Academy candidate population, previously used in scaling AFOQT scores, the normative base was the nationwide 12th grade male population.
- 328 **Osburn, H.G., Sheer, D.E., Elliott, J.M., & Mullins, C.J.** Validation of a carefulness test battery against training school criteria. March 1964. (PRL-TDR-64-7, DDC Document AD-441 947) (Project 7719, Task 771905; Contract AF 41(657)409, University of Houston). Assuming that Air Force jobs differ in the extent to which carefulness is required, a test that measures carefulness would be a useful addition to the aptitude indexes of the Airman Qualifying Examination in classifying new airmen. 13 tests were selected or newly developed as possible measures to be validated against training school criteria and instructor ratings of carefulness. Airmen in 3 courses (Communications Center Specialist, Data Processing Machine Operator, Reciprocating Engine Mechanic), selected as requiring a high degree of carefulness for successful completion, took the tests. By correlation and multiple linear regression techniques, it was found that adding the monotonous detail type of carefulness test to the aptitude indexes improved prediction of the training school criteria for 2 of the 3 samples. An activity preference questionnaire did not add significantly to prediction, while a group of risk-taking tests seemed more closely related to the aptitude measures than to the carefulness criteria.
- 329 **Harding, F.D. & Downey, R.L., Jr.** Electronic engineer job types in the Air Force Systems Command. March 1964. (PRL-TDR-64-8, DDC Document AD-602 447) (Project 6755, Task 675501) (OTS). As a basis for developing career-progression patterns for engineering officers, each Electronics Engineer working within the Systems Command completed a checklist of his job activities and a questionnaire about appropriate training, previous experience, and the most desirable next assignment. By a computerized grouping technique, the 1664 individuals responding were clustered into 14 job types. Each job type is described by the pattern of job activities performed and the consensus about desirable previous experience and future assignments. These descriptions show that over 70% of the Electronics Engineers work as project officers, contract managers, and administrators rather than at instrumentation and research. The consensus of the respondents was that R & D or engineering management training and experience are important prerequisites for job types such as Project Officer and Program Administrator.
- 330 **McReynolds, Jane.** Use of the Airman Qualifying Examination to predict completion of basic training. April 1964. (PRL-TDR-64-9, DDC Document AD-442 047) (Project 7719, Task 771905) (OTS). The rate of failure in basic training for high school graduates is about one-fourth that for nongraduates. As one means of identifying recruits likely to succeed, tests and aptitude indexes of the Airman Qualifying Examination were used in a multiple regression procedure to predict success in

basic training. Airman samples used in deriving the prediction equation included 1,767 high school graduates and 537 nongraduates, with each sample split to allow for cross-checking. An equation derived from the 4 aptitude indexes applied to a nongraduate sample provided a composite score that correlated .23 with the basic training criterion. When a simplified form of the equation was applied to the scores of an independent sample of 1,696 high school nongraduates, prediction was a little less accurate, but the composite continued to provide additional screening information. Score distributions for the successful and unsuccessful subgroups indicated that the composite score could be useful as an additional screening procedure when Air Force quotas can't be met with recruits who have finished high school.

- 331 Madden, J.M., Hazel, J.T., & Christal, R.E. Worker and supervisor agreement concerning the worker's job description. April 1964. (PRL-TDR-64-10, DDC Document AD-443 510) (Project 7734, Task 773402). To compare worker and supervisor descriptions of what constitutes the worker's job, an inventory of 479 tasks, listed under 15 duties, was completed independently by 94 airmen and their immediate supervisors. Analyses of responses in terms of tasks performed, time spent on each task, and task difficulty led to the following conclusions. When compared to supervisors' estimates, subordinates did not tend to exaggerate the number or the difficulty of tasks they perform. Supervisors showed higher agreement with subordinates on a broad (duty) work level, than on a more specific (task) work level. Agreement concerning where the subordinate spends his work time was 73% at the duty level, but was only 48% at the task level. Agreement between supervisors and subordinates concerning the subordinates' jobs varied under several definitions of agreement. Agreement was approximately 90% when defined in terms of performance or nonperformance of all tasks in the inventory. It was approximately 57% when defined in terms of performance of those tasks checked either by the supervisor or incumbent, and only 48% when defined in terms of how the subordinate spends his work time at the task level. Since there was only moderate agreement between supervisors and subordinates concerning the nature of the subordinates' job, and since there was no tendency for the subordinates to exaggerate the nature of their jobs, it is preferable to collect job information directly from incumbents.
- 332 Gagg, D.B. Using mark-sense cards for collecting occupational information. April 1964. (PRL-TDR-64-11, DDC Document AD-603 108) (Project 7734, Task 773401) (OTS). This study reports on the feasibility of automatic processing of occupational data recorded on IBM mark-sense cards as an alternative to key punching the data written in inventory booklets. 3 administrative procedures were used in collecting information from 367 Air Police (77XXX) incumbents. Comparisons of accuracy, processing time, and costs were made across data-processing methods, skill level, and administrative procedure. With carefully designed inventory and card formats, visual scanning, machine editing, and top maintenance of the IBM reproducer, the mark-sense technique was found feasible, but more expensive than the key-punch method. The 2 administrative techniques, in which incumbents marked whether they performed each task in the inventory before adding unlisted tasks, elicited twice as many write-in statements as the third technique, where incumbents were merely to read the listed statements before adding write-ins. When the incumbents rated tasks for both amount of time spent and training required, the correlation between the ratings was lowest when the first ratings were not visible during the second rating.
- 333 Fruchte., Dorothy A. & James, L.F. Development of a counseling form for use by supervising officers. May 1964. (PRL-TDR-64-12, DDC Document AD-603 109) (Project 7719, Task 771904; Contract AF 41(609)2012, Psychological Research Service, Inc.) (OTS). A counseling interview form was devised to aid supervisory officers in making constructive use of the officer evaluation procedure. From reports of previous studies of counseling procedures in both military and civilian organizations, 100 items were selected and categorized for inclusion in 3 tryout forms: a checklist, a forced-choice form, and a level-of-achievement form. 1200 officers (400 for each form) were asked to complete an interview form for one subordinate officer and to rate the importance of each interview item on a separate item acceptability form. Interview items were validated against the subordinate officer's Overall Rating from his most recent OER. A revised form included 66 items selected on the basis of validity and acceptability ratings. 100 officers completed revised interview and item acceptability

forms. The final form of 50 items is thus an interview guide composed of items of proven relevance to success as an Air Force officer. However, analysis of rating officers' comments gave little evidence of interest in using such a device.

- 334 Alvord, R.W. & Fwing, Faye. Project M analysis of USAF officer input. May 1964. (PRL-TDR-64-13, DDC Document AD-448 084) (Project 7719, Task 771904). The Project M file is a comprehensive data bank covering records of a large proportion of Air Force officers beginning with those commissioned in 1955. This report relates retention data to various status and ability variables for 72,000 officers entering the Air Force from 1955 through 1962. Of these, 63.2% remained active at the end of 1962. Retention rates are reported by year of entry, by procurement source, by flying status, by educational achievement, by age, by AFOQT Officer Quality score, and by career-field assignment. Effects of changing emphasis in procurement sources are reflected in the trends of educational level and regular officer appointments. Input has increased in officers with scientific college training, but loss rates have remained higher than for other academic areas. The expanded Project M records provide a source for determining quality relationships among the younger officers now comprising over one-third of active duty Air Force officers.
- 335 Harding, F.D. & Merck, J.W. Markov chain theory applied to the prediction of retirement rates. June 1964. (PRL-TDR-64-14, DDC Document AD-603 110) (Project 6755, Task 675505) (OTS). This paper demonstrates the feasibility of applying Markov chain theory to predict officer retirement rates over selected time periods. The chain of career states is based on total years of military service. Possible categorization for projecting group retirement rates is illustrated by distributing the 1962 officer roster according to flying status and according to career area. Data are the actual changes during the first half of 1962. Broader and more complex input information will be required to provide projections for use in personnel planning.
- 336 Madden, J.M. & Giorgia, M. Joyce. Identification of job requirement factors by use of simulated job descriptions. June 1964. (PRL-TDR-64-15, DDC Document AD-444 779) (Project 7734, Task 773402). Air Force officer jobs are evaluated by rating a verbal job description on 10 requirement factors. If these factors cover all the requirements, judging merited pay or grade for the job incumbent could be based on a simulated job description presenting only the numerical ratings on the 10 factors. To test this assumption, 2 groups of USAF majors ranked 30 real job descriptions and 2 groups ranked simulated descriptions in order of merited pay. Application of a multiple regression technique to the factor values showed that error in predicting the rank-order criterion was significantly greater for rankings from simulated descriptions than from the verbal descriptions. Examination of mean-rank discrepancies showed that, in this particular sampling of jobs, the ranking of simulated jobs was higher for jobs closely concerned with the primary defense mission and lower for jobs requiring a high level of scientific, professional, or technical competence. Adding ratings on these 2 factors to the simulated descriptions might result in judgments closer to those obtained from verbal descriptions.
- 337 Neel, G.J., Whitehead, L.K., & Bottenberg, R.A. Calculation of the percentage points of the  $F$ -distribution. June 1964. (PRL-TDR-64-16, DDC Document AD-605 820) (Project 7719, Task 771901) (OTS). This paper reports a procedure for computing the cutoff  $F$  statistic (percentage point), given the probability ( $P$ ) and the degrees of freedom determined by the experimental design. The technique involves applying a previously developed computing program to compute  $F$  from a trial value of  $F$ . From the discrepancy between the computed  $P$  and required  $P$  a new trial value of  $F$  is determined. Iteration continues until the trial value of  $F$  produces a computed probability acceptably close to the required probability. An appendix gives the FORTRAN listing of the computing program.
- 338 Tupes, E.C. & Shaycoft, Marion F. Normative distributions of AQE aptitude indexes for high-school-age boys. July 1964. (PRL-TDR-64-17, DDC Document AD-665 821) (Project 7717, Task 771703; Contracts AF 41(657)324 and AF 41(609)1588, American Institute for Research) (OTS). The Air Force Airman Qualifying Examination (AQE) yields 4 aptitude indexes (General, Administrative, Mechanical, and Electronics) which are used in the selective recruiting, enlistment, and initial assignment of basic airmen. This report presents distributions in percentile form of the

four AQE aptitude indexes for nationwide groups of 12th grade boys, 18-year-old boys, and 15-year-old boys based on equivalent aptitude composites of Project TALENT tests. Distributions are also given for 12th grade boys by region of the country, and, for those planning to enlist immediately after high school graduation, by the branch of the military service in which they plan to serve. These data are designed to be useful to recruiters as indications of the aptitude potential available to them and to high school guidance counselors as an aid in interpreting AQE scores achieved by their students.

- 339 **Miller, R.E. Predicting first year achievement of Air Force Academy cadets, class of 1964. July 1964. (PRL-TDR-64-18, DDC Document AD-448 480) (Project 7717, Task 771706) (OTS).** Applicants for each Air Force Academy class take a battery of selection tests to establish their qualifications. Entering cadets take an additional battery consisting mainly of nonacademic experimental tests, developed as part of a program for the production of officer selection and classification devices. Both batteries are validated at the end of the fourth class year against academic and nonacademic criteria. In the class of 1964 the criteria were the Academic Standard Score, Cadet Effectiveness Rating (CER), Residualized Cadet Effectiveness Rating (with respect to physical aptitude), Extracurricular Activities Standard Score, Nonacademic Standard Score, and Early Motivational Elimination. Using multiple regression techniques, it was found that there are measures in both the selection and experimental batteries having validity for each of the criteria. Multiple correlations up to .63 were obtained with the Academic Score as the criterion, and up to .51 with the CER. Validities are not significantly different from those observed in the class of 1963 for selection tests common to both classes. Previously observed fluctuating validities appear to have stabilized.
- 340 **Alvord, R.W. Project M: Data development and analyses in support of officer management. July 1964. (PRL-TDR-64-19, DDC Document AD-606 971) (Project 7719, Task 771904) (OTS).** Project M has been broadened from the original concept of a limited longitudinal study of careers of Regular officers commissioned since 1959 from selected procurement sources. It now includes all officers commissioned from all important sources since 1955. The information recorded for each officer is accumulated periodically for a wide range of categorical variables. This permits description of the total officer population for any year in terms of these variables and comparison of the characteristics and career potential of officers from different procurement sources. Charts and tabulations illustrate the kind of information available for use in determining management policy. The comprehensive data files may be used not only for projections on the basis of trends, but also to determine selection factors predictive of high quality and high retention rates.
- 341 **Judy, C.J. Contribution of education to the rated effectiveness of weather officers. July 1964. (PRL-TDR-64-20, DDC Document AD-607 635) (Project 6755, Task 675502) (OTS).** This paper compares accuracy of prediction of officer effectiveness ratings from information about educational attainment and from information about the officer's military record (grade, type of commission, source of commission, aeronautical rating). Multiple regression techniques were applied to data for 1671 weather officers. Results showed that, although military grade and type of commission (regular or reserve) were the best single predictors, both educational level and college major were also significantly predictive of the officer efficiency rating. In combination with all the other variables, educational level still added significantly (.01 level) to prediction, but information about the officer's college major did not.
- 342 **Wiley, L. Relation of job qualification ratings to performance ratings of basic training instructors. July 1964. (PRL-TDR-64-21, DDC Document AD-607 670) (Project 7734, Task 773404) (OTS).** Among the many studies of selection and classification instruments, few have shown high relationship between selection tests and job performance ratings. It was hypothesized that some of the prediction failures could arise from mixing jobs with dissimilar requirements in the criterion data. The job of tactical instructor (TI) was selected to test whether a job requiring all incumbents to perform the same tasks would yield reliable performance data which would be predictable from a battery of qualifications ratings. 55 NCO supervisors rated 527 TIs on overall job performance and on 45 job qualification characteristics. By multiple regression techniques, it was found that characteristics ratings accounted for 75% of the variance in the overall ratings. 3 months later 53 of the supervisors rerated 482 TIs. The correlation between the 2 ratings (reliability) was .72. Overall ratings

of 309 TIs by 12 supervisory lieutenants correlated .63 with the reratings. Ratings of the 45 characteristics accounted for 60% of the rerate variance and 50% of the variance in lieutenants' ratings. The findings are consistent with the hypothesis that some of the unpredictability of job performance ratings may be due to mixing dissimilar jobs in collecting criterion data.

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- 343 Christal, R.E. & Bottenberg, R.A. Procedure for keying self-report test items. August 1964. (PRL-TR-64-22, DDC Document AD-608 066) (Project 7719, Task 771901) (OTS). Self-report questionnaires on opinions, attitudes, and personal history are commonly used to develop personality, attitude, and experience measures. This paper outlines a procedure for selecting the most valid keying pattern for scoring such items to predict a success or proficiency criterion. There are only  $\frac{3^k + 1}{2}$   $2^k$  unique ways in which a  $k$ -alternative item can be keyed, assuming that each alternative is scored +1, -1, or 0. Unique scoring patterns are presented for computer application to items with 2, 3, 4, and 5 alternatives. Procedures are outlined for generating and checking patterns for  $k$ -alternative items. Computation shortcuts are suggested.
- 344 Miller, R.E. Predicting first year achievement of Air Force Academy cadets, class of 1965. August 1964. (PRL-TR-64-23, DDC Document AD-608 067) (Project 7717, Task 771706) (OTS). Candidates for each Air Force Academy class are required to establish their qualifications by taking a battery of selection tests. Those who are admitted are given a battery of experimental tests as part of a program for the development of officer selection and classification instruments. Predictive validities are determined for both batteries at the end of the fourth (freshman) class year against academic and nonacademic criteria of interest to Academy personnel. In the class of 1965 the criteria were the Academic Standard Score, the Military Rating (successor to the Cadet Effectiveness Rating), the Extracurricular Activities Standard Score, the Composite Standard Score, and Early Motivational Elimination. It was found that the experimental battery contains valid tests for each criterion, and that the selection battery contains valid tests for each criterion except Early Motivational Elimination. The experimental tests add to prediction from the selection battery of each criterion except the Academic Standard Score. The best multiple validity coefficients range from .31 for prediction of Early Motivational Elimination to .60 for prediction of the Academic and Composite Standard Scores. Tests common to the classes of 1964 and 1965 have similar validities and distribution statistics in the two classes.
- 345 Cantrell, G.K., Holdrege, F.E., DeGauh, R.A., & Mullins, C.J. Application of a psychometric-clinical approach to personnel selection for counterinsurgency duty. October 1964. (PRL-TR-64-24, DDC Document AD-608 804) (Project 7717, Task 771707) (OTS). Volunteers for assignment to counterinsurgency duty were screened by a combination of psychological tests and interview assessments. The tests included measures of aptitude, ability, personality, attitude, interests, and biographical data. In the initial phases an assessment score was obtained by combining the ratings of 3 interviewers: a psychiatrist, a clinical psychologist, and personnel psychologist. This team rating was used both for selection of candidates and as a criterion for validating test and personal data variables. Through successive regression analyses, variables not contributing to prediction of the criterion were eliminated. The final products were 2 screening batteries that might be field-administered and scored: an officer selection battery and an airman selection battery.
- 346 Naylor, J.C. & Wherry, R.J., Sr. Feasibility of distinguishing supervisors' policies in evaluation of subordinates by using ratings of simulated job incumbents. October 1964. (PRL-TR-64-25, DDC Document AD-610 812) (Project 7734, Task 773404; Contract AF 41(609)1596, Ohio State University) (OTS). In this study it was found that supervisors in 4 specialties differed in the importance they attached to selected qualifications in subordinates, when these subordinates were known to them only by patterns of trait scores. Thus the importance of traits needed in a given specialty can be assessed by using simulated rather than actual job incumbents. The technical

problems considered in the statistical analyses involve some recent developments in the application of regression techniques. Groups of 50 supervisors in AFSCs 43171, 43190, 64670, and 64770 rated a set of 250 profiles of trait scores representing subordinates in AFSCs 43151, 43171, 64650, and 64750. Each supervisor assigned 250 worth-to-the-Air Force ratings, using a 9-point scale and fixed allotments of each value. These ratings served as criteria, with the trait scores as predictors, providing a regression equation for each rater (his policy). Using the Judgment Analysis (JAN) technique, the policies were grouped, and the loss in prediction computed when moving from 50 different equations (policies) to a single equation for a given specialty. Average predictions were high (e.g.,  $R^2 = .80$ ), and the grouping loss small (e.g., a drop of .10 in  $R^2$  from 50 to 1 equation). Comparing JAN to factor analysis techniques, it was concluded that the JAN method was efficient, but that a factor strategy method aided in qualitative interpretation of rater policies. Demographic and personal data collected on the raters showed no meaningful relationship to their policies.

- 347     Harding, F.D. & Wong, K.K.L. Attitudes and career intentions of Officer Training School graduates. October 1964. (PRL-TR-64-26, DDC Document AD-610 056) (Project 6755, Task 675501) (OTS). Information about the attitudes, job satisfactions, and career intentions of graduates of the Air Force Officer Training School (OTS) was obtained after the respondents had completed about 18 months of commissioned service. The results were compared with findings obtained at the time of graduation from OTS. Career intentions crystallized during the intervening months as the undecided made up their minds. Consistency of opinion was shown by the fact that about two-thirds of those who had expressed an opinion at time of graduation still retained the same opinion. Information obtained at time of graduation was still predictive of career intent, as was educational and assignment information. An attitude measure, the Importance-Possibility Scale, showed that a sense of accomplishment and competent supervision were rated among the most important of the 22 job attributes. Significant differences in distribution of ratings were found between the career-minded and noncareer-minded groups.
- 348     Valentine, L.D., Jr. & Tupes, E.C. Officer promotion procedures: I. An analysis of officer promotion actions. October 1964. (PRL-TR-64-27, DDC Document AD-452 943, all distribution controlled by Hq USAF (AFPMFJA) (Project 7719, Task 771904). Data from actions of the FY 1962 Promotion Boards for majors, lieutenant colonels, and colonels were used to estimate reliability of decisions and the relationship of Promotion Scores to Officer Effectiveness Reports (OERs). A series of statistical analyses showed that: (1) the evaluations and resulting recommendations regarding promotion are reliable; (2) from 80 to 90 percent of the decisions would have been concurred in by a hypothetical second board; (3) the nearer an eligible is placed to the selection cutoff score, the greater the likelihood that the promotion decision about him would have been reversed by a second board; and (4) while mean OER is related to Promotion Score, it has been shown that other factors also contribute to this score. An appendix describes the method of estimating reliability of panel scores and board decisions.
- 349     Alvord, R.W. & Tupes, E.C. Officer promotion procedures: II. Feasibility of computer applications in the promotion of USAF officers. October 1964. (PRL-TR-64-28, DDC Document AD-453 086, all distribution controlled by Hq USAF (AFDPCE) (Project 7719, Task 771904). This study reviews initial results of research designed to test the feasibility of using an electronic computer to assist in the USAF promotion process. Mechanics of the selection process are explained and relationships examined between information contained in officer personnel files and selection for promotion under the existing system. Coded magnetic tape records of eligible officer groups were analyzed to derive an equation for each group which, when applied to known selection folder variables, produced a predicted promotion score for each individual. These scores were cross-validated against board scores for a number of officer groups and proved highly predictive of actual selections. Accuracy of prediction varies with the grade of the group being considered. Predictive accuracy is most precise for those cases in the high and low score areas and less accurate for those falling near the selection cut off imposed by quota limitations. Techniques were suggested for using computer processed data to support promotion actions and to improve selection reliability with a reduced net workload.

- 350 Tupes, E.C., Alvord, R.W., & Valentini, L.D., Jr. Officer promotion procedures. III. Increasing the reliability of promotion board evaluations. October 1964. (PRL-TR-64-29, DDC Document AD-455 410, all distribution controlled by Hq USAF (AFPMPIA) (Project 7719, Task 771904). While promotion board evaluation scores and recommendations are quite reliable under the present system, a certain degree of unreliability is present which results in the promotion or nonpromotion of a small percentage of eligibles on the basis of factors other than past performance and potential. Several methods are available for decreasing the small amount of unreliability now present. Some of these methods would require increasing the number of raters per eligible, although not with an increase in the size of Headquarters USAF boards. Others could be accomplished by a rearrangement of evaluation procedures with no increase in the overall number of raters. Others, by making use of the Mean OER or a prediction composite score, would increase reliability and at the same time permit a reduction in the number of members per board. Any of the suggested procedures would be expected to result in an increase in the reliability of the final promotion recommendations, and the use of any two or more of them in combination would probably result in even higher reliability.
- 351 McKendry, J.M. & Lindsay, C. A word picture checklist for Officer Effectiveness Reports. November 1964. (PRL-TR-64-30, DDC Document AD-611 875) (Project 7719, Task 771904; Contract AF 41(609)2020, IIRB-Singer, Inc.) (OTS). A feasibility study was conducted to convert the Word Picture section of the current Officer Effectiveness Report (OER) into a checklist of descriptive items. A set of OERs was reviewed to select content areas. A checklist of 100 items was assembled and tried out with over 1000 raters who rated subordinate officers by both an OER and the experimental checklist. From raters' evaluations and item analysis, 56 items were selected for cross validation with another 1000 raters. A high proportion of the selected items correlated positively with the OER ratings and about 60 percent of the raters favored adoption of the checklist concept. Reliability of the procedure and influence of a checklist in the official rating process were not considered in this study.
- 352 Elson, Jo Ann (Ed.) Abstracts of personnel research reports: V. 1964. December 1964. (PRL-TR-64-31, DDC Document AD-610 800) (OTS). This volume includes abstracts of the 31 technical reports issued by the Personnel Research Laboratory in 1964. They cover studies in selection, classification, and utilization of Air Force personnel; systematizing information flow in support of personnel planning; methods of describing, evaluating, and structuring Air Force jobs, and development of procedures for improving the quality of Air Force personnel.
- 353 Morsh, J.E., Giorgio, M. Joyce, & Madden, J.M. A job analysis of a complex utilization field: The R&D management officer. January 1965. (PRL-TR-65-1, DDC Document AD-613 476) (Project 7734, Task 773401) (OTS). Using data collection procedures developed for airman career fields, the 6 specialties in the R&D Management Utilization Field were surveyed. A job inventory composed of 373 task statements and a background information sheet was developed and mailed to all Air Force R&D Management Officers. Analysis of 825 completed inventories by an iterative grouping technique allocated 675 of the officers' jobs to 27 job types, each including at least 5 jobs. The dominant job type (R&D Manager) included nearly half of the R&D Management Officers. Most of the job types cut across grade levels and organization levels. Reported minimum academic requirements were a bachelor's degree with major in science or engineering. Some officers considered graduate training in management or administration desirable and some suggested additional experience in operational commands. The incumbent officers averaged more experience and education than they judged to be minimal. An appendix gives the computer printouts of job descriptions for two of the identified job types: R&D Project Staff Officer, Foreign Technology Staff Officer.
- 354 Ewing, Faye & Alvord, R.W. USAF officer career decisions: Predictability of initial career intent. February 1965. (PRL-TR-65-2, DDC Document AD-613 333) (Project 7719, Task 771904) (CESTI). This is the first report of a longitudinal study designed to determine the predictability of an Air Force officer's career decision and at what stage he makes the final decision. A survey sample of newly-commissioned officers drawn from all procurement sources completed a questionnaire concerned with personal data and attitudes toward an Air Force career. Responses were validated against the criterion item of stated career intent. A key developed on half of the sample was applied



to the other half with a resulting correlation of .43 between the empirical score and statement of expressed career intent. Descriptions of career and noncareer officers emerged from response frequencies to the personal and biographical items. More of the noncareer entering officers are single, had a stable home life, were in the upper third of their class, attended private schools, and had a specialized college major; more of the career officers are married, had a transient home life, began working early, attended state universities, and were in the middle third of their class. A previously derived "Retainability Score" proved only moderately predictive of expressed career intentions. Sources with the most favorable career-noncareer ratios were the service academies and the now-defunct Officer Candidate School. These ratios determined at time of commissioning formed much the same pattern and were only slightly higher than actual retention ratios previously determined for other samples.

- 355 Hazel, J.T., Bourdon, R.D., & Madden, J.M. Effect of sorting procedure on ranking error. February 1965. (PRL-TR-65-3, DDC Document AD-614 639) (Project 7734, Task 773402) (CFSTI). Ranking is often used to provide criterion measures, although the effect of varied sorting procedures on ranking accuracy is unknown. This study investigates the efficiency of four sorting methods varying in degree of structure. Efficiency was defined in terms of the absolute difference between the judged rank order of a series of 50 irregularly shaped figures graduated by size and the rank order of these figures based on their physical measurement. Analysis of these errors revealed that the procedure with the greatest restriction of freedom was significantly more inefficient than three less restrictive procedures. With simple stimuli, there appears to be an optimal degree of structure, beyond which ranking efficiency decreases. Comparison of present with previous evidence suggests efficiency of sorting procedure may vary as a function of task complexity.
- 356 Tomlinson, Heien. Defining technical information needs for a research laboratory. March 1965. (PRL-TR-65-4, DDC Document AD-614 820) (Projects 6755, 7717, 7719, 7734) (CFSTI). A checklist survey form listed 78 areas of probable or possible interest to members of a personnel research laboratory. Staff members responded to each item by marking one of 4 degrees of interest. A computer grouping technique was applied to cluster the 71 interest profiles in terms of common interests. 7 groups were identified and characterized by the major overlapping topics. The final cluster that included all staff members provided a listing of the topics in terms of overall laboratory concern. Results define the organization's technical information requirements and identify specialized consultants on acquisition and indexing problems.
- 357 Judy, C.J. Use of high school record information in predicting success in electronics training. March 1965. (PRL-TR-65-5, DDC Document AD-616 731) (Project 7719, Task 771906) (CFSTI). High school record information (along with test information) was used to predict technical school performance of 433 airmen completing Air Force courses for which a score of 80 on the Electronics Aptitude Index was recommended. It was found that presently used information on the completion of five high school courses is useful in adding to the prediction of a technical school grade criterion, and that information on other high school courses improves this prediction significantly. A further increase in the predictive utility of high school record information can be realized if level-of-performance information on certain high school courses is added to completion data on those same courses.
- 358 Merck, J.W. A Markovian model for projecting movements of personnel through a system. March 1965. (PRL-TR-65-6, DDC Document AD-616 704) (Project 7719, Task 771901) (CFSTI). A large centrally controlled organization needs an accurate projection of future personnel requirements. A computer-processed mathematical model is developed which simulates movements of personnel through the system, with the movements based on empirically derived probabilities, the transit on rates. Significant variables are selected, such as career field, length of service, grade, that distribute the system members in a vector of states upon which a probability matrix operates to produce the estimated distribution of personnel at the end of the next time interval, say a year. By iteration, the model can provide estimates for any number of years in the future. Proposed policy changes (e.g., accelerated promotion) can be entered into the system to forecast their effects. In establishing a model, the basic decision is the selection of variables that will characterize the members. The first requirement is that reliable input data be available for the current and preceding time intervals.

- 359 Hazel, J.T. & Madden, J.M. Evaluation of officer jobs versus evaluation of specialties. March 1965. (PRL-TR-65-7, DDC Document AD-617 334) (Project 7734, Task 773402) (CFSTI). Evaluation data on 30 officer specialties were gathered from 2 groups of raters for comparison with results previously obtained when jobs were evaluated. With the same 20 factors used previously, 88 officers evaluated the specialties on a point scale against a criterion of merited pay, and another 86 against a criterion of merited grade. In addition, each officer rank-ordered the 30 specialties in terms of the criterion for his group. Correlation matrices were computed based on the mean factor ratings and mean rank-orders of specialties. Differences in evaluation results were as follows: (1) A comparison of matrices based on jobs and specialties revealed there were more negative intercorrelations among factors when ratings were made on specialties (32%) than when jobs were rated (9%). (2) For 15 factors, tests of the differences between validity coefficients on the 4 criteria (merited pay and grade of jobs and merited pay and grade of specialties) indicated the 4 values were not all estimates of the same population value. (3) From multiple regression analyses to predict rank-order from factor ratings, more factors were found which had non-zero weights on job-based criteria than on specialty-based criteria. Because of certain advantages with jobs and the heterogeneity of pay and grade levels within specialties, jobs seem to be the preferable units to use in a point system of evaluation.
- 360 Lecznar, W.B. Performance on Airman Qualifying Examination by regional areas and by sex. April 1965. (PRL-TR-65-8, DDC Document AD-617 335) (Project 7719, Task 771906) (CFSTI). To provide an aptitude description of the recent airman recruiting population, score distributions on the Airman Qualifying Examination were collected for the population tested from January-September 1962 on AQE-F and from October 1962-December 1963 on AQE-62. AQE-F samples were male enlistees from each of the 10 regional areas, a female sample, and a recruiting sample drawn randomly from nonenlistees and recruits. The AQE-62 samples included 2 samples of male recruiting examinees and 2 of women. The AQE-F data provided regional comparisons that supported previous findings of differences in mean aptitude indexes. The sex findings showed that the male recruits averaged higher on mechanical and electronics tests than the women. The recruiting population of AQE-62 averaged higher than the AQE-F recruiting sample on all aptitude indexes, indicating that the high school testing program of USAF Recruiting Service is having a favorable impact on the quality of Air Force enlistees.
- 361 Morsh, J.E. Identification of job types in the personnel career field. April 1965. (PRL-TR-65-9, DDC Document AD-622 433) (Project 7734, Task 773401) (CFSTI). A job inventory covering 11 specialties in the Personnel Career Field and consisting of 260 tasks grouped under 12 duty categories was administered by mail to 1647 airmen in 21 major commands. Incumbents of all skill levels completed a background information sheet and rated on a 5-point scale the relative time spent on tasks. A computerized hierarchical grouping procedure applied to the time-spent data was used to identify and describe 34 significant job types. Job types were found to cut across commands and to some extent across grades and AFSCs. Job types identified supported the present mechanized shredout and existing specialties in the Personnel Career Field. Task descriptions of jobs as performed by the several specialties and by groups with differing amounts of active federal service showed that the number and kinds of tasks performed and the time spent on them vary with incumbents' job type, grade, and experience.
- 362 Tupes, E.C. AQE norms for high school seniors and Air Force training groups. May 1965. (PRL-TR-65-10, DDC Document AD-619 346) (Project 7717, Task 771705) (CFSTI). The Airman Qualifying Examination (AQE) provides four aptitude indexes (General, Administrative, Mechanical, and Electronics) which are used in the selective recruiting and initial assignment of basic airmen. This report presents normative data for nationwide groups of 12th grade boys and 12th grade girls and for groups of airmen assigned to technical training in the Air Force. Percentile distributions are presented for all 12th grade boys and all 12th grade girls by type of high school and/or curriculum, by region of the country, and by size of city within each region. For those not entering college after high school graduation, percentile distributions are shown by region of the country and by city size within each region. For the Air Force technical school groups, percentile distributions are presented along with estimates of the probable success in training of airmen at each aptitude index level.

- 364 Lecznar, W.B. & Klesch, J.K. Development and preliminary validation of the Electronic Data Processing Test-63. June 1965. (PRL-TR-65-12, DDC Document AD-622 339) (Project 7717, Task 771705) (CFSTI). As a result of increasing automation of Air Force records, it is necessary to identify airmen who can be trained to handle new electronic data processing equipment. The Electronic Data Processing Test 63 (EDPT-63) was developed to meet this need. The test is composed of 4 subtests: Arithmetic Reasoning, Figure Analogies, Number Series, and Verbal Analogies. This report covers the development and initial validation of EDPT-63 for technical courses 685X0 and 687X0. The test's effectiveness was compared to other possible predictors such as the aptitude indexes of the Airman Qualifying Examination, education, and the Armed Forces Qualification Test (AFQT). EDPT-63 was found to have substantial validity for all of the samples available. In many instances, it was the best single predictor and when its 4 subtests were optimally weighted, they yielded a substantially higher multiple correlation than all other predictors combined. The next most effective predictor was the General Aptitude Index of the Airman Qualifying Examination.
- 365 Tupes, E.C. & Kaplan, Margorie N. A preliminary investigation of rater differences in Officer Effectiveness Reports. July 1965. (PRL-TR-65-13, DDC Document AD-622 340) (Project 7719, Task 771904) (CFSTI). A sample of 1,790 Air Force officers was identified, each of whom had rated at least 4 different officers during 1960-1961 on the Officer Effectiveness Report (OER). The mean OERs received by these same officers during the 1956-1959 period were used in connection with the 1960-1961 OER ratings to obtain 4 difference scores for each of the 1,790 raters, which were averaged to obtain an Average Difference Score. The reliability of the Average Difference Score was estimated, and it was used as a criterion to identify rater characteristics associated with the tendency to rate consistently high or low. The conclusions of the study were that rater differences on the OER did exist and that these were related to certain other characteristics of the raters. However, neither the differences nor the relationships were great enough in magnitude to be of practical value, and it was concluded that additional research on the study of rater differences in the OER rating system was unlikely to be fruitful.
- 366 Madden, H.L. & Lecznar, W.B. Development and standardization of Airman Qualifying Examination-64. August 1965. (PRL-TR-65-14, DDC Document AD-622 807) (Project 7717, Task 771705) (CFSTI). This report describes the development and standardization of the 1964 form of the Airman Qualifying Examination (AQE-64) for use in the Air Force selective recruitment and high school testing programs. It was designed to parallel AQE-62, its immediate predecessor, and also to capitalize on research data that indicated the predictive efficiency of the aptitude composites could be increased through crediting completion of certain high school subjects. Standardization of AQE-64 was by the equipercentile method, but norms were tied to Project TALENT samples of 1960 rather than the World War II mobilization population previously used. Complete statistical data on test items, composite score distributions, and intercorrelations for TALENT and AQE subtests are a part of the report.
- 367 Christal, R.E. Officer grade requirements project: I. Overview. September 1965. (PRL-TR-65-15, DDC Document AD-622 806) (Project 7734, Task 773402) (CFSTI). The Officer Grade Requirements (OGR) Project was accomplished to determine the appropriate distribution of grades for Air Force officer positions. Descriptions were obtained for 79,759 officer jobs in grades lieutenant through colonel, and a subset of 3,575 descriptions was drawn from this file to serve as a "criterion sample." A special Hq USAF Policy Board, composed of 22 colonels, was called to determine the appropriate grade for each job in the criterion sample. Subsequent analyses revealed that (1) board members were confident in their grade ratings, (2) board members were not biased toward jobs in particular commands or specialties, (3) board members agreed with each other concerning the appropriate grade levels for particular jobs, and (4) board members did not give inflated ratings and did not simply confirm current UMD authorizations. Each job was rated on its own merits.
- Phase II of the OGR study involved expressing the policy of the Hq USAF board in the form of a mathematical equation which weights certain job requirement factors demonstrated to be relevant for grade determination. This equation, which had a validity of .92 for grades awarded by the Policy

Board to jobs in the criterion sample, was applied to determine the appropriate grade requirements for an additional 10,000 officer jobs. Results were then projected to determine the appropriate distribution of grades for various specialties and specialty groupings.

- 368 Kaapke, L.D., Tupes, E.C., & Alvord, R.W. A multiple linear regression analysis of officer career attitudes. October 1965. (PRL-TR-65-16, DDC Document AD-627 651) (Project 7719, Task 771904) (CFSTI). A survey covering demographic, sociological, and attitudinal information was completed by a random sample of 5,000 junior Air Force officers. Their responses were evaluated in terms of their relationship to a criterion of expressed career intention. Multiple linear regression analyses were used to measure the unique contribution to prediction of some of the survey items beyond that provided by certain "baseline" variables believed to predict career intent. A second analysis was completed on a subsample of officers grouped by source of commission and subdivided by length of commissioned service, regular or reserve status, nonrated or rated flying status, and science-engineering or nonscience and nonengineering groupings. Data illustrate that career intent can be more meaningfully evaluated in terms of membership variables than by gross source of commission grouping normally employed. Six survey items offered the greatest unique contribution to the prediction of the criterion: (1) family attitude toward an Air Force career; (2) factors influencing for and against a career; (3) effect of the offer of a regular commission; (4) challenge of the Air Force job versus a civilian job; (5) the importance and possibility of achieving certain incentives and rewards as part of an Air Force career; and (6) the officers' feelings about frequent change of residence.
- 369 Kaplan, Margorie N. & Alvord, R.W. USAF officer evaluation system survey: attitudes and experience. November 1965. (PRL-TR-65-17, DDC Document AD-628 551) (Project 7719, Task 771904) (CFSTI). More than 2,200 Air Force officers from 38 bases in 6 commands were intensively surveyed as to their knowledge, attitudes, and opinions about the officer evaluation system. In many areas, significant differences were found between commands, grades, duties, regular/reserve officers, and flying status groups when reactions of these groups were compared to reactions of the total sample. Analysis of the attitudes revealed by the survey indicated that although the majority of officers are satisfied to some extent with procedures now utilized in the evaluation system and the performance ratings they have received, a substantial number seemed to be in favor of a number of changes. By and large, this trend is related to grade - the higher the grade, the greater the satisfaction with the *status quo*.
- 370 Hazel, J.T. Officer grade requirements project: II. Job descriptions, sample selection, and criterion board. November 1965. (PRL-TR-65-18, DDC Document AD-629 575) (Project 7734, Task 773402) (CFSTI). The Officer Grade Requirements Project was undertaken to determine an optimal Air Force officer grade structure, stated in terms of the number of officers required in grades lieutenant through colonel. Due to its scope, several reports are necessary to explain the project. The first report of the series gave the purpose, phases, and a description of the method and preliminary findings. The present report describes in detail the three following steps of the project: (1) development of a suitable format and collection of standardized job descriptions of the work performed by approximately 80,000 officers; (2) selection of a criterion sample of 3,575 descriptions representing all levels and types of officer jobs; (3) selection and conduct of a Headquarters USAF Policy Board to provide criterion measures (grade ratings) for the job sample.
- 371 Tomlinson, Helen. Classification of information topics by clustering interest profiles. November 1965 (PRL-TR-65-19, DDC Document AD-628 597) (Project 6755, 7717, 7719, 7734) (CFSTI). A computer program was applied to cluster indexing terms into field-of-interest categories, defined by responses of staff members of a personnel research laboratory. This provides a practical scheme for document classification. The method clusters successively pairs of topics that have the highest probability of being marked together by the scientist as both being of interest or neither one of interest. Ten fields of interest related to the group mission were identified by this hierarchical grouping.
- 372 Tupes, E.C. A method for establishing USAF Recruiting Service group enlistment objectives based on aptitude and interest characteristics. November 1965. (PRL-TR-65-20, DDC Document AD-629 574) (Project 7717, Task 771705) (CFSTI). Enlistment objectives are presently assigned by

the United States Air Force to each of its Recruiting Groups on the basis of the proportion of the general population residing in the area covered by that group. In the present report, information is presented concerning differences in the aptitudes and willingness to serve in the Air Force of potential enlistees in the Recruiting Groups. A method is illustrated whereby enlistment objectives are established which take into account such differences with the result that each Recruiting Group is given a more equitable share of the total enlistment quota. A further revision is suggested which would permit each Recruiting Group to subdivide its own enlistment objectives on the basis of the sizes of the cities and communities within its recruiting area.

- 373 Miller, R.E. Predicting first year achievement of Air Force Academy cadets, class of 1966. December 1965. (PRL-TR-65-21, DDC Document AD-630 916) (Project 7719, Task 771904) (CFSTI). Candidates for admission to each Air Force Academy class are required to demonstrate their qualifications on a battery of selection tests. Qualified candidates who enter the Academy are given a battery of experimental tests upon entry as part of a program for the development of officer selection and classification instruments. In the class of 1966, a subset of experimental instruments was moved into the field and given a trial under selection conditions. Another subset was administered to selectees prior to entry. All selection and experimental tests were validated against criteria which became available at the end of the fourth class (freshman) year. Criteria used were the Academic Standard Score, the Military Rating, the Extracurricular Activities Standard Score, the Composite Standard Score, and Early Motivational Elimination. It was found that the experimental battery contains tests valid for each criterion and that the selection battery contains tests valid for each criterion except Early Motivational Elimination. For every criterion except the Academic Standard Score, some set of experimental tests was found which added significantly to prediction from the selection battery alone. The best multiple validity coefficients for each criterion ranged from .33 for Early Motivational Elimination to .59 for the Academic Standard Score. The best multiple validity for the Military Rating was .48. Tests given to the classes of 1965 and 1966 had similar validities and distribution statistics in both classes.
- 374 Moersh, J.E. Evolution of a job inventory and tryout of task rating factors. December 1965. (PRL-TR-65-22, DDC Document AD-629 573) (Project 7734, Task 773401) (CFSTI). The results of surveys of the Personnel Career Field conducted in 1959, 1961, 1963, and 1964 are reported. Improvements in inventory content and format and in administrative procedures were incorporated with each successive survey. In the last two surveys incumbents completed a background information sheet and rated the relative time spent on tasks. A computerized hierarchal grouping procedure applied to the time-spent data was used to identify and describe job types. In the 1962 survey 35 significant job types were found. In the 1964 survey 34 job types were identified. Job types tend to cut across commands and to some extent across grades and specialties. In the 1964 survey, in addition to relative time spent, subsamples of incumbents used four other task rating factors: technical assistance required, frequency of performance, difficulty of learning by on-the-job training, and training emphasis. Results of the tryout of these ratings are also reported.
- 375 Elson, Jo Ann (Ed.) Abstracts of personnel research reports: VI. 1954-1965. December 1965. (PRL-TR-65-23, DDC Document AD-636 607) (CFSTI). This volume includes abstracts of the 374 technical reports issued by the Personnel Research Laboratory January 1954 through December 1965. They cover studies in selection, classification, and utilization of Air Force personnel, systematizing information flow in support of personnel planning, methods of describing, evaluating, and structuring Air Force jobs, and development of procedures for improving the quality of Air Force personnel.
- 376 Madden, H.L. & Tupes, E.C. Estimating reading ability level from the AQE general aptitude index. February 1966. (PRL-TR-66-1, DDC Document AD-632 182) (Project 7717, Task 771705) (CFSTI). Conversion tables are presented for estimating reading achievement (reading grade level as measured by the California Achievement Test and scaled score as measured by the Davis Reading Test) from the AQE General Aptitude Index. Distributions of estimated reading grade are shown for non-prior-service airmen entering the Air Force in 1964 and 1965 for the total group and for subgroups split on years of education completed. Distributions of estimated reading grade are also

presented by career field for airmen assigned to 29 career fields. It was pointed out that a wide range of reading ability was found within each career field and that the career fields differed considerably with respect to average reading ability. Implications for writing of Career Development Courses and technical manuals were discussed.

- 377 Massey, Iris H. & Mullins, C.J. Validation of the recruiter-salesman selection test. February 1966. (PRL-TR-66-2, DDC Document AD-632 358) (Project 7719, Task 771906) (CFSTI). An eight-test experimental battery for selection of recruiter-salesmen was administered to 210 students taking the Recruiter Course at Lackland AFB. An interim operational battery (the Recruiter-Salesman Selection Test-63) was constructed, using the results of the preliminary testing of this small sample. Administration of the eight-test experimental battery was continued, however, until approximately 1000 recruiter-salesman course students had been tested. Background variables of age, education, marital status, number of dependents, length of military service, and AQE scores were combined with the test variables and analyzed to determine possibility of greater predictive power of other combinations of variables or of different weights for variables already included in the RSST-63. The predictor variables were correlated against school success and against a field rating criterion. Approximately half the group was used as a computing sample and the remainder as a cross-validation sample. Results indicated that the tests of the RSST-63, weighted as originally described, predict pass/fail in Recruiter School as well as it can be predicted ( $r = .21$ ) by any combination of the variables used in this study. No combination of these variables predicts field ratings. It is doubtful that any predictor will be found to be valid against available field criteria.

- 378 Hazel, J.T. & Cowan, D.K. Evaluation of airman jobs by four categories of raters. June 1966. (PRL-TR-66-3, DDC Document AD-640 567) (Project 7734, Task 773402) (CFSTI). To investigate differences between rater groups in their evaluation of airman jobs, four groups of raters each evaluated a sample of 200 airman job descriptions. The groups consisted of senior NCOs, lieutenants, captains, and field grade officers. The jobs were evaluated in terms of merited grade, merited pay, and the relative importance of five job requirement factors. Within groups each job was evaluated by five raters and across all groups by 20 raters. The raters also indicated their confidence in the grade level ratings they made.

The analyses used to compare the four groups were concerned with differences in means, distributions, variability, and reliability of ratings and the predictive efficiency of the five job requirement factors. These analyses revealed two statistically significant ( $P < .01$ ) differences among groups. The mean of the grade ratings by senior NCOs was higher than each of the officer means, and the field grade officers expressed greater confidence in their assigned grade ratings than the other groups. However, the NCO difference seemed of little practical consequence, and there was agreement among the groups with regard to the reliability and homogeneity of assigned ratings, and the level of predictive efficiency of the five job requirement factors. The present findings support the use of a composite group of raters to evaluate airman jobs.

- 379 Passey, G.E. & McLaurin, W.A. Perceptual-psychomotor tests in aircrew selection: historical review and advanced concepts. June 1966. (PRL-TR-66-4, DDC Document AD-636 606) (Project 7719, Task 771904, Contract AF 41(609)-2796, The Lockheed-Georgia Company) (CFSTI). This report reviews the literature reflecting the employment of perceptual psychomotor tests for selection of aircrew members since World War II and provides behavioral concepts for consideration as possible future test development areas. The review considers the use of flight experience as well as perceptual-psychomotor screening devices and comments on the results of the programs in which such experience is intentionally used. The fundamental importance of criterion definition to development and validation of selection devices is discussed. Recent research is reviewed leading to the derivation of behavioral concepts recommended for consideration as principles on which new perceptual psychomotor tests may be based. The merits of simple tests as opposed to complex tests in which numerous facets of performance are concurrently assessed are considered and the latter approach is recommended. References are included in support of the review and critical items are annotated.

380 Miller, R.E. Development of officer selection and classification tests-1966. June 1966. (PRL-TR-66-5, DDC Document AD-639 237) (Project 7717, Task 771706) (CFSTI). Two new tests for use at the officer and student officer level were constructed for implementation in fiscal year 1966. These are the Air Force Officer Qualifying Test-66 (AFOQT) and the AFROTC Pre-Enrollment Test-66 (PET). The former succeeds AFOQT-64 in the normal two-year replacement cycle and closely resembles AFOQT-64 in format, type of content, and procedures for construction and standardization. It yields Pilot, Navigator-Technical, Officer Quality, Verbal, and Quantitative composite scores. Standardization was accomplished with reference to the Project TALENT battery in a manner which permits relating scores on the new test form to performance of Air Force Academy candidates and 12th grade males. A similar procedure was used in standardizing AFROTC PET-66. This test is an adaptation of the former Precommission Screening Test-62. It yields a total score based on verbal and quantitative items. It is intended as a screening device for college freshmen who apply for the AFROTC program.

381 Moersch, J.E. Job types identified with an inventory constructed by electronics engineers. June 1966. (PRL-TR-66-6, DDC Document AD-645 056) (Project 7734, Task 773401) (CFSTI). Using data collection procedures set forth in Air Force Manual 35-2, the Electronics Engineer Air Force officer specialty was surveyed. A job inventory developed by officer incumbents at Wright-Patterson Air Force Base was composed of 117 task statements and a Background Information Sheet. The inventory was completed by 673 electronics engineering officers in 11 major air commands, over 80 per cent of the officers being in the Air Force Systems Command. Analysis of the survey data by means of a hierarchical grouping technique allocated 575 of the officers' jobs to 18 job types, each of which included at least five members. Expected job types reflecting shreds authorized in 1964 were not found. Field grade and company grade officers were grouped together in all except three job types. Job types tended also to cut across commands and organizational levels. Entry level and fully qualified Electronics Engineers performed essentially the same work activities. The part of the job allocated to planning, directing, supervising, and coordinating duties increased with grade, but allocation decreased with grade for evaluating and performing duties. Computer printouts of the definitive tasks for officer grades surveyed and for the 17 job types identified are shown in appropriate tables.

382 Malden, H.L., Valentine, L.D., Jr., & Tupes, E.C. Comparison of the airman qualifying examination with the differential aptitude tests. July 1966. (PRL-TR-66-7, DDC Document AD-639 238) (Project 7719, Task 771900) (CFSTI). In the high school testing program of the USAF Recruiting Service, there is occasional reference to the relationship between the Airman Qualifying Examination and civilian tests. Information in this area can be useful in the hands of guidance counselors. This report contains data on the relationships between the Differential Aptitude Tests and the Airman Qualifying Examination. Tables are presented which can be used to estimate DAT scores from the AQE aptitude indexes or to estimate AQE aptitude indexes from DAT scores. It appears that the AQE and DAT measure essentially similar abilities.

383 Hanzel, J.T. Comparison of merited grade and skill level ratings of airman jobs. August 1966. (PRL-TR-66-8, DDC Document AD-645 054) (Project 7734, Task 773402) (CFSTI). Two hundred airman job descriptions were evaluated by senior NCOs, company grade officers, and field grade officers in terms of merited skill level, merited grade, confidence in assigned grade ratings, and extent to which five job requirement factors were demanded. Comparisons were made to determine group differences in skill level ratings and the relation between merited grade ratings and skill level ratings of airman jobs.

The group differences observed were statistically significant in two aspects. The skill level ratings of the NCO group were more reliable than those of the officer groups, and the mean of the NCO skill ratings was larger than the means of the ratings given by officers.

Two statistically significant differences were obtained which indicated that merited grade was superior to merited skill level as a criterion in airman job evaluation. The merited grade ratings were more reliable than the merited skill level ratings, and the level of productive efficiency of five job requirement factors was higher for a merited grade criterion.

- 384 Brokaw, L.D., & Georgia, M. Joyce. Development of benchmark scales for Air Force officer position evaluation. September 1966. (PRL-TR-66-9, DDC Document AD-645 055) (Project 7734, Task 773402) (CFSTI). This study provides a refinement of the procedures previously developed for the determination of the appropriate distribution of officer grades for the Air Force to permit application of the same position evaluation procedures to individual officer positions. A scale of benchmark jobs with titles of established successive levels of requirements was used to derive a set of job requirement factor scales. These scales were applied to 1000 Air Force officer position descriptions collected and previously applied in the Officer Grade Requirements Study. Comparison of rating distributions based upon adjective scales and the benchmark scales revealed lower mean values, larger standard deviations, and superior zero-order validity of the ratings based on the benchmark scales. The predictive efficiency of optimal composites of the benchmark scales was equivalent to that of the adjective scales. A set of integer weights for use in field application of the equations was derived without significant loss of validity.
- 385 Hazel, J.T. Merited grade versus merited pay rankings of airman jobs. October 1966. (PRL-TR-66-10, DDC Document AD-649 765) (Project 7734, Task 773402) (CFSTI). This study used two approaches to determine whether the merited grade and merited pay rankings of airman jobs differ significantly. In one approach the same group of raters judged 200 airman jobs on both merited grade and merited pay. In the other approach two different groups of raters judged these same 200 jobs on only one of the dimensions, either merited grade or merited pay. There was no evidence to indicate that airman jobs are ranked in a significantly different order in relation to merited pay and grade. Rather, there was a highly significant level of agreement between the two sets of ranks for both the intrarater and independent group analyses.
- 386 Morsh, J.E., Archer, W.B., & Kudrick, H.M. Occupational survey of veterinary career ladders. September 1966. (PRL-TR-66-11, DDC Document AD-663 872) (Project 7734, Task 773401). A job inventory covering six specialties in the Veterinary and Laboratory Animal Career Ladders, and consisting of 256 tasks grouped under 11 duty categories, was administered to 327 airmen in 14 major air commands. Incumbents of all skill levels completed a background information sheet and rated on a 7-point scale the relative time spent on tasks. The airmen also indicated on a 7-point scale the length of time they had spent on the job before first performing each task. Job descriptions are presented for 22 groups selected according to background information variables, including 6 specialty groups and 10 groups with differing lengths of the 13 significant job types identified by the automated job clustering program, and the composite job description of the total sample are also given. A group overlap matrix shows the similarity of groups in terms of time spent on tasks. Summary tables indicate the percentage of members in each group who perform each task and the average percentage of time spent on each task by group members. Group difference descriptions are given for certain specialty groups. Distributions of background variables for the total sample and for specialty groups and job types are also presented. An analysis of work experience shows the average time spent on the job by group members before performing tasks. In Appendix 1, tables list the entire sample surveyed in terms of background information, present work assignment, and organization and base. The inventory of duties and tasks used in the survey is included in Appendix 2.
- 387 Archer, W.B. Computation of group job descriptions from occupational survey data. December 1966. (PRL-TR-66-12, DDC Document AD-653 543) (Project 7734, Task 773401) (CFSTI). The analysis of occupational survey data is demonstrated in detail, using miniature examples. Beginning with the responses of 10 incumbents to a job inventory consisting of 10 task statements, composite job descriptions are derived for (a) special groups of incumbents, selected on the basis of background information data, and (b) job type members, identified by an automated job clustering program. Computer outputs from both types of analyses are illustrated and explained.
- 388 Wiley, L.N. Describing airman performance in the administrative career ladder by identifying patterns of trait ratings. November 1966. (PRL-TR-66-13, DDC Document AD-653 544) (Project 7734, Task 773404) (CFSTI). Trait ratings were used to account for the variance in airman performance reports and in overall experimental performance ratings. Airmen in the administrative career ladder, DAFSUs 70230, 50, 70, and 70490, across all commands, were rated by supervisors on overall performance and on 65 traits. Current overall airman performance reports (APRs) were



obtained from base records. Among the 2,606 sets of ratings with complete data, 1,082 individuals were evaluated twice, representing personnel rated by two supervisors. Broken down by skill levels, the smallest *N* was 140, for 9-level men who had been rated twice. Using data undifferentiated by skill in which a man might appear twice if so rated, trait ratings accounted for 70 per cent of the variance in experimental performance ratings and about 43 per cent of the variance in APRs, after grade was removed as a predictor. When data were sorted by skill level, prediction held up in all skills except DAFSC 70270, where it dropped to 60 per cent. Patterns of traits which were more predictive of performance in one skill level than another were found, and these patterns could be sensibly interpreted in terms of the expected demands of the jobs. In a cross-validation against different raters, the predictive advantage of selected patterns was found to be statistically significant for the 5-, 7-, and 9-skill levels. The study is discussed in terms of its implications for criterion development, particularly in respect to its place in the sequence of current criterion research studies.

- 389 Miller, R.E. Relationship of AFOQT scores to measures of success in undergraduate pilot and navigator training. October 1966. (PRL-TR-66-14, DDC Document AD-656 303) (Project 7719, Task 771906) (CFSTI). Scores on the Pilot, Navigator-Technical, and Officer Quality composites of the Air Force Officer Qualifying Test (AFOQT) were compared with measures of success in undergraduate pilot and navigator training. The samples consisted of 4,993 student pilots and 2,132 student navigators who entered training over a period of approximately two years. Each sample was subdivided according to source of commission and, in the case of the pilot sample, by type of aircraft and curriculum. Correlations of AFOQT composite scores with criteria of success were computed within each of 16 samples and subsamples thus defined. Criteria were training grades and graduation vs. elimination by various categories. Selected validity coefficients were corrected for range restriction in 4 samples.

In general, there was good prediction of training grades, academic elimination, flying deficiency elimination, and elimination for all reasons combined. Elimination for motivational reasons was predictable in some groups. Military elimination occurred infrequently but was negatively predictable in the total navigator sample.

- 390 Hoggatt, R.S. & Christal, R.E. Officer grade requirements project: III. Analysis of criterion board rating behavior. November 1966. (PRL-TR-66-15, DDC Document AD-676 647) (Project 7734, Task 773402) (CFSTI). The Officer Grade Requirements project was accomplished to determine the appropriate distribution of grades for Air Force officer positions. Descriptions were obtained for 79,759 officer jobs in grades lieutenant through colonel, and a subset of 3,575 descriptions was drawn from this file to serve as a criterion sample. A special Hq USAF policy board composed of 22 colonels was called to determine the appropriate grade for each job in this criterion sample. Previous analyses have revealed that about 92 per cent of the grade-rating variance was associated with rater agreement, leaving only roughly 8 per cent of the total variance unexplained. This unexplained variance, which is normally reported as error variance, is associated with disagreement among raters concerning the appropriate grade levels for jobs. In the present study, an attempt was made using regression analysis to account for rater disagreement in terms of variables associated with the raters and with the rating situation. For example, it was hypothesized (a) that certain raters would contribute more variance to the disagreement vector than would other raters; (b) that more disagreement would be associated with the first day's ratings than with ratings collected on subsequent days; and (c) that more disagreement would be associated with jobs in less familiar areas, such as scientific and engineering, than with jobs in more commonly known areas. In all, 81 such predictors were hypothesized and tested. Only 6 per cent of the rater-disagreement variance could be accounted for, which is statistically significant but leaves most of the differences in ratings unexplained. Even so, the results are of considerable consequence. For example, there is no evidence that the CGP Criterion Board members should have been given a "warm-up" day prior to the collection of the ratings actually used in determining the appropriate distribution of grades for Air Force officer positions.

A second goal of the study was to account for the variance in the raters' level of confidence in their grade ratings. Approximately 22 per cent of this variance could be explained with predictors associated with the raters and the rating situation.

- 391 Hazel, J.T., Christal, R.E., & Hoggatt, R.S. Officer grade requirements project: IV. Development and validation of a policy equation to predict criterion board ratings. November 1966. (PRL-TR-66-16, DDC Document AD-659 125) (Project 7734, Task 773402) (CFSTI). The Officer Grade Requirements (OGR) Project provides a scientific procedure for determination of the appropriate distribution of officer grades, lieutenant through colonel, required by the Air Force. Because of its complexity the project was conducted in three phases and is reported in several papers (OGRs I, II, and III in PRL-TR-65-15, 65-18, and 66-15). This report offers detailed information concerning the derivation of a policy equation to reliably and accurately estimate the grade ratings assigned 3,575 jobs by a Hq USAF Criterion Board.
- The jobs in the criterion sample were evaluated in terms of merited grade and ten job requirement factors by 1,246 majors and lieutenant colonels in the field. From a list of 181 predictors the final OGR policy equation was derived through the computation of 343 multiple linear regression problems. The data from these analyses indicated that the final policy equation was parsimonious, highly reliable, and efficient in predicting the grade ratings assigned by the Criterion Board. These findings justified proceeding with further efforts necessary to determine the total distribution of Air Force officer grade requirements.
- 392 Wiley, L.N., Jenkins, W.S., Cagwin, L.P., & Kudrick, H.M. Job types of communications officers, DAFSC 3034. November 1966. (PRL-TR-66-17, DDC Document AD-658 025) (Project 7734, Task 773404) (CFSTI). A job inventory was constructed to cover the tasks of the communications officer, DAFSC 3034. This inventory was administered to all available communications officers and officers in closely related activities during the spring of 1962. Of the 1,204 inventories analyzed, 1,043 were completed by officers in DAFSC 3034. Others were completed by officers in related specialties. Tasks were checked only if they were performed by the respondents. Task grouping analysis resulted in 19 job types. Two of these, comprising 189 and 90 officers, were quite similar to DAFSC 3034 officers as a whole, and a third type of 80 officers emphasized the maintenance aspect of the specialty. Smaller distinct job types could be readily recognized and given appropriate job titles.
- 393 Miller R.E. Predicting first year achievement of Air Force academy cadets, class of 1967. November 1966. (PRL-TR-66-18, DDC Document AD-660 121) (Project 7717, Task 771706) (CFSTI). Qualifications of candidates for admission to the Air Force Academy are demonstrated on a battery of selection tests. In addition, qualified candidates who are admitted to the Academy are administered a battery of experimental tests upon entry. This battery is part of a continuing program for the development of officer selection and classification instruments. For the classes of 1966 and 1967, a subset of these experimental tests was administered with the selection tests under operational conditions, and a second subset was administered to selectees prior to entry. All selection and experimental tests were validated against criteria which became available at end of the fourth class (freshman) year. These criteria were the Academic Standard Score, the Military Rating, the Extracurricular Activities Standard Score, the Composite Standard Score, and Early Motivational Elimination. Tests common to the classes of 1966 and 1967 tended to be somewhat more valid in the class of 1967 for the same criteria. For each criterion except the Academic Standard Score, some set of experimental tests was found which contributed uniquely and validly to the predicted criterion variance in the context of the selection tests. The highest multiple correlations found were .66 for prediction of the Academic Standard Score, .53 for prediction of the Military Rating, .46 for prediction of Extracurricular Activities Standard Score, and .29 for prediction of Early Motivational Elimination. The Composite Standard Score was found to correlate highly with the Academic Standard Score and was not used as a criterion for multiple regression analysis. Zero-order validities for prediction of this criterion ranged up to .52.
- 394 Merish, J.E. & Christal, R.E. Impact of the computer on job analysis in the United States Air Force. October 1966. (PRL-TR-66-19, DDC Document AD-656 304) (Project 7734, Task 773401) (CFSTI). In keeping with present trends toward the automation of personnel information, the Air Force method of job analysis provides for the exploitation of advances in electronic computer technology. Computer capability is applied not only in the analysis of job inventory data but also in

the construction, administration, and publication phases of the procedure. During inventory construction the computer is used to prepare alphabetic lists of tentative task statements according to pertinent key words. This grouping by topic facilitates the detection of redundancy and insures the elimination of duplicate statements. In the administration phase, the computer selects the required sample of job incumbents from current personnel rosters maintained on magnetic tape. In addition, the computer prints names and addresses on appropriate labels to attach to inventories for mailing. It is in the area of occupational data analysis, however, that the computer makes its most impressive impact. By application of a complex program consisting of over 50,000 instructions, those incumbents in a survey sample who perform essentially the same job are grouped together, and a job description composed of duties and tasks is published for each such job type identified. The computer also lists information available for each case and reports means, standard deviations, and distributions of values for specified variables. Composite job descriptions may also be obtained for any group defined in terms of job-related variables such as grade, specialty, years of experience, or specialized training. Other programs compute and generate tables showing group similarities and group differences, thus providing a condensed picture of interrelationships or revealing dissimilarities among job types or other groups. And finally, a program selects and arranges the job descriptions, tabular outputs, and explanatory text materials in any desired order and publishes the complete job analysis survey report.

- 395 Barlow, Esther (Ed.) Abstracts of personnel research reports. VII. 1966. December 1966. (PRL-TR-66-20, DDC Document AD-666 419) (CFSTI). This volume includes abstracts of the 20 technical reports issued by the Personnel Research Laboratory in 1966. They cover studies in selection, classification, and utilization of Air Force personnel, systematizing information flow in support of personnel planning; methods of describing, evaluating, and structuring Air Force jobs; and development of procedures for improving the quality of Air Force personnel.
- 396 Christal, R.E. Selecting a harem--and other applications of the policy-capturing model. March 1967. (PRL-TR-67-1, DDC Document AD-658 025) (Project 7719, Task 771901; Project 7734, Task 773402) (CFSTI). This paper describes how a mathematical equation, derived with the fixed-X multiple linear regression model, can be used to define and implement the policy of an individual or rating board. The model, which has been discussed in previous papers, is described in easy-to-follow, non-technical language. Several applications of the model are presented.
- 397 Mullins, C.J. An attempt to predict automobile accidents among Air Force personnel. July 1967. (PRL-TR-67-2, DDC Document AD-660 122) (Project 7719, Task 771906) (CFSTI). An attempt was made to find test variables which would add significantly to the variables of age, miles driven, and aptitude in the prediction of automobile accidents. Of 40 test variables investigated, not one offers much promise as a useful predictor. Number of miles driven was the only substantial accident predictor. Knowledge of previous driver training did not predict accidents.
- 398 Ward, J.H., Jr., Buchhorn, Janice, & Hall, Kathleen. Introduction to PERSUB. August 1967. (PRL-TR-67-3 (I), DDC Document AD-660 578) (Project 7719, Task 771901) (CFSTI). Four examples of the application of the PERSUB subroutine system to data analysis problems are presented. Examples of all steps involved in data preparation, flow chart of computational steps, coding of program instructions, compiling and executing the program are presented in detail. The listing of each program with corresponding results is presented. A second version of each program containing extensive comments is also included.
- 399 Ward, J.H., Jr., Hall, Kathleen, & Buchhorn, Janice. PERSUB reference manual. August 1967. (PRL-TR-67-3 (II), DDC Document AD-660 579) (Project 7719, Task 771901) (CFSTI). This report describes the PERSUB subroutine system. PERSUB is a set of matrix-oriented subroutines developed primarily for the purpose of providing the researcher a maximum of flexibility in designing a sequence of analyses to be carried out on research data. With a few minor exceptions, the system is written entirely in FORTRAN. The report contains a listing of the source program and a brief description of each subroutine. The system was originally developed for use on a 16K IBM 7040 with two channels, three tape units per channel, and one disk unit. It should compile and run with few modifications on any similar configuration with a larger core or addition peripheral units.

- 400 Mullins, C.J. Prediction of success in instructional programmer school. August 1967. (PRL-TR-67-4, DDC Document AD-660 132) (Project 7719, Task 771906) (CFSTI). Twenty-six predictors of student success in learning the techniques of programmed instruction were investigated against four criteria of school success. One of the most predictable of the four criteria was the typical standard of training, the final average grade. Three predictors predicted this criterion in a cross-validation sample at a rather high level ( $R = .56$ ). Validities of these predictors are presented.
- 401 Vitola, B.M. & Madden, H.L. Development and standardization of Airman Qualifying Examination-66. August 1967. (PRL-TR-67-5, DDC Document AD-661 996) (Project 7717, Task 771705) (CFSTI). This report describes the development and standardization of the 1966 form of the Airman Qualifying Examination. Descriptive data and statistical characteristics of AQE items and subtests are presented, as well as intercorrelations among Project TALENT tests and AQE variables. The report was designed as a reference source to be used in the Air Force's selective recruiting program and to provide information to guidance counselors in the high school testing program.
- 402 Tupes, E.C., Bottenberg, R.A., & McReynolds, Jane. An analysis of certain methods for increasing the validity of the Airman Qualifying Examination for the classification of basic airmen. August 1967. (PRL-TR-67-6, DDC Document AD-661 997) (Project 7717, Task 771705) (CFSTI). Screening and initial assignment of non-prior-service enlistees in the United States Air Force is based primarily on relative standing on any one of four aptitude composites, each derived by a simple summation of scores on certain subtests of the Airman Qualifying Examination (AQE). The present report describes a study designed to determine the increase in validity for prediction of performance in technical training courses which might be obtained by the use of (a) aptitude composites derived from optimally weighted subtests along with additional information, or (b) separate aptitude composites derived for each technical course, or (c) separate aptitude composites derived for enlistees from different geographical areas, or (d) various combinations of these variables. Data from 46,000 enlistees and 88 technical courses were analyzed. It was concluded that both the addition of information to the aptitude composites and the utilization of separate composites for each technical course would significantly increase the validity of the selection and classification system.
- 403 Madden, H.L. & Valentine, L.D., Jr. Conversion tables for Airman Qualifying Examination and employee aptitude survey scores. August 1967. (PRL-TR-67-7, DDC Document AD-661 998) (Project 7719, Task 771906) (CFSTI). In the high school testing program conducted by the USAF Recruiting Service there is occasional reference to relationships between the Airman Qualifying Examination and certain civilian tests. Information concerning these relationships can be useful to guidance counselors. This report contains data on the relationships between the Employee Aptitude Survey and the Airman Qualifying Examination. Conversion tables for estimation of EAS scores from AQE aptitude indexes and subtest scores are presented, as well as tables for estimation of AQE aptitude indexes from EAS scores. The two batteries appear to measure essentially similar abilities.
- 404 Vitola, B.M., Valentine, L.D., Jr., & Tupes, E.C. Aptitude and educational data for Air Force enlistees, 1962 through 1965. August 1967. (PRL-TR-67-8, DDC Document AD-664 035) (Project 7717, Task 771705) (CFSTI). The Airman Qualifying Examination (AQE) yields four separate aptitude indexes: General, Administrative, Mechanical, and Electronics. These indexes are used in selective recruiting and initial classification of basic airmen. This report presents graphic and tabular summary data on the AQE performance of Air Force enlistees for the period 1962 through 1965. Percentile distributions indicate an upward trend in AQE aptitude index levels. There are also indications that positive relationships exist between levels of education and measured aptitude, and between region of enlistment and measured aptitude. These findings appear to have direct implications on assignment of enlistment objectives.
- 405 Morsh, J.E., Archer, W.B., & Kudrick, H.M. Occupational survey of the medical materiel career ladder 915X0. September 1967. (PRL-TR-67-9, Vol I, DDC Document AD-663 315; Vol II, DDC Document AD-663 316) (Project 7734, Task 773401). A job inventory covering four specialties in the Medical Materiel Career Ladder, and consisting of 409 tasks grouped under 17 duty categories was administered to 1033 airmen in 17 major air commands. Incumbents of all skill levels completed a

background information section and rated on a 7-point scale, the relative time spent on tasks. The airmen also indicated on a 7-point scale how they learned to do the tasks performed, whether from school training or work experience. Job descriptions are presented for 9 groups selected according to background information variables. Included are 4 specialty groups, and 5 groups with differing lengths of military service. Duty and task descriptions are presented for the Medical Materiel Ladder total sample, for 8 major job type clusters, for 2 job type sub-clusters, and for 37 significant job types identified by the automated job clustering program.

A group overlap matrix shows the similarity of groups in terms of time spent on tasks. Summary tables indicate the percentage of members in each group who perform each task. Group difference descriptions are given for the total sample, for the four specialty groups, and for eight major job clusters are also shown. A table indicating how tasks were learned is reported for 5-skill level airmen who attended the basic medical materiel course and for those who did not attend the course. In Appendix 1 responses to items in the background information section are presented for every case in the survey. The inventory of duties and tasks used in the survey is included in Appendix 2.

- 406 Ewing, Faye. USAF officer career intent after first year of active duty. August 1967. (PRL-TR-67-10, DDC Document AD-664 037) (Project 7719, Task 771904) (CFSTI). This is the second report of a longitudinal study designed to determine the predictability of an Air Force officer's career decision and to evaluate relationships between career intent and various demographic, environmental and attitudinal factors. The USAF Active Duty Survey #1, the first year active duty followup, was completed by those subjects who had participated in the precommissioning phase of the study. Responses were validated against the criterion of stated career intention. A Career-Intent Key developed on half the sample was applied to the other half of each commissioning source. Resulting correlations ranged from .48 to .67 between the empirical score and career-intent statement. Various experimental scoring techniques were applied to a Job Importance-Job Possibility Scale. Of the experimental measures, the Positive Score appears to be the best predictor of career retention. Based on responses to the career-intent statement, the most favorable source for retention is OCS, followed by OTS-AECP and the Academies. One characteristic noted at this point, after one year's active duty, is the beginning shift away from the "uncertain" career-intent category. A slight trend away from high career intent toward low career intent is also noted for all sources except USMA.

- 407 Morsh, J.E. & Archer, W.B. Procedural guide for conducting occupational surveys in the United States Air Force. September 1967. (PRL-TR-67-11, DDC Document AD-664 036) (Project 7734, Task 773401) (CFSTI). This procedural guide sets forth in detail the procedures for collecting, organizing, analyzing, and reporting information describing work performed by Air Force officers and airmen. Specific steps in the application of the Air Force method of job analysis are presented in chronological order.

The guide has been designed to (a) provide guidance to Air Force and other agencies who propose to construct and administer job inventories, (b) assemble information about the Air Force method of job analysis which is now available only from scattered sources, (c) indicate problems found in applying the Air Force method and suggest possible solutions, (d) summarize hitherto unreported experience gained during occupational surveys, (e) acquaint using agencies with the products of occupational surveys, and (f) provide briefing material where summary information about the Air Force method is required.

- 408 Grappe, L.B., Alvord, R.W., & Poland, J.V. Air Force officer performance evaluation: rating trends and relationships from 1954 through 1965. October 1967. (PRL-TR-67-12, DDC Document AD-669 076) (Project 7719, Task 771904) (CFSTI). The success of a performance evaluation system is at least partially assessed through observation and experience. This report is a documentation of the thinking, the effort, and the results of research based on an accumulation of selected data from officer effectiveness reports prepared during the period 1954 through 1965, and deemed to be of general interest to those either engaged in the study of performance assessment or directly responsible for the evaluation of performance. Development of the complex Officer Effectiveness Report Data Bank, its periodic updates, and its current status as a source of continued research are briefly

discussed. A number of categories relating to the magnitude of the data base and the description of rating trends and rating relationships are treated separately. Recurring differences in performance measures (mean OERs) are noted between the officer grades for regular vs. reserve, rated vs. nonrated, and among the major commands and duty AFSC groups. In almost every instance, inflationary trends were prevalent for each grade; exceptions to these trends were apparent for a short period in 1961 following the introduction of AF Form 707 when the mean OER for all field grades dropped significantly and a short period in 1963 following the revision of AF Form 77 when the mean OER for all company grades dropped slightly. Similar mean OER differences (from data available only for 1965) were found between grades, for different periods of supervision and for different grades of the reporting official.

- 409 Fortuna, A.L. (Ed.) Personnel research and systems advancement. December 1967. (PRL-TR-67-13, DDC Document AD-666 097) (Contract AF 41(609)-3173, Southwest Research Institute) (CFSTI). Papers included in these Proceedings were presented at the Symposium on Personnel Research and Systems Advancement sponsored by the USAF Personnel Research Laboratory. Topics covered by the speakers include reviews of activities underway in the field of personnel research, as well as projections into future activities of researchers, planners, and managers in both academic and operational settings. The papers reflect a wide range of experience and interests of speakers representing the military services, governmental agencies, and private industry.
- 410 Hazel, J.T. Development, selection, and validation of factors for the evaluation of airman jobs. August 1967. (PRL-TR-67-14, DDC Document AD-672 957) (Project 7734; Task 773402) (CFSTI). The purpose of this study was to develop, select, and validate efficient and reliable sets of factors and weights for use in evaluating airman jobs. A representative sample of 200 incumbent-prepared airman job descriptions served as the criterion sample evaluated by senior NCOs, lieutenants, captains, and field-grade officers with respect to merited grade, merited pay, and 15 job requirement factors designed specifically for airman jobs. Various combinations of 37 predictor variables, including the 15 factors, were considered in 1,296 regression analyses (480 reported) made to derive and validate optimally weighted grade and pay policy equations. The grade policy equation, which involved eight variables, accurately predicted the grades awarded jobs in the criterion sample by the raters ( $R^2 = .95$ ). The pay policy equation, which consisted of the same eight variables and one other, also accurately predicted raters' judgments of pay ( $R^2 = .93$ ). Subsequent analyses with weights developed and cross-applied in 100-job subsamples indicated that both policy equations were very stable. Comparison of the overall-group grade policy equation with grade policy equations developed for each of the four groups which provided criterion and factor ratings revealed no important differences. The predictive efficiency of the policy equations and of all predictor combinations investigated was about the same for the four rater groups. Although the field-grade officers expressed significantly greater familiarity with airman jobs than the other rater groups, the actual mean differences in the ratings were judged to be of little practical consequence and too small to preclude having airman jobs evaluated by a composite group of senior NCOs, lieutenants, captains, and field-grade officers.
- 411 Cragun, J.R. & McCormick, E.J. Job inventory information: Task and scale reliabilities and scale interrelationships. November 1967. (PRL-TR-67-15, DDC Document AD-681 509) (Project 7734, Task 773401; Contract AF 41(609)-1604, Purdue University) (CFSTI). Officer job incumbents in three utilization fields were surveyed with job inventories to determine the reliability of task information and the reliability of five different rating scales used to rate tasks performed, the relationships between the five rating scales, and incumbent reactions to the inventories and the scales. Inventories were administered twice to the same job incumbents at a four-month interval. Each inventory included one of the five rating scales on the basis of which job incumbents reported additional information about the tasks performed. These scales were Time-Spent, Importance, Part-of-the-Position, Difficulty, and Method-of-Learning. Some incumbents received the same scale for the second administration, and others received a different scale. Questions pertaining to the adequacy of the inventory and the rating scale were also answered. Task, duty, and overall reliabilities were obtained on both the inventories and the scales, and correlations were computed for various scale combinations. A regression analysis was used to identify variance components of the Part-of-the-Position scale. Several major conclusions were drawn on the basis of the results of these procedures: (a) Reliabilities of job information reported by checklist inventories are moderately high to high. (b)

The Time-Spent, Importance, and Part-of-the-Position scales exhibit satisfactory reliabilities, with the highest reliabilities obtained for the Time-Spent and Part-of-the-Position scales, followed closely by the Importance scale. (c) The independent variables of Time-Spent and Importance scale values (and certain derivations of these scales) account for more of the Part-of-the-Position variance than do other independent variables. (d) Of the various scales used by incumbents to characterize the tasks they perform, the Part-of-the-Position scale appears to be the best particularly in terms of its reliability and the reactions of the incumbents to it.

- 412 Smith, T.H., Gott, C.D., & Bottenberg, R.A. Predicting the potential for active duty success of rehabilitated Air Force prisoners. October 1967. (PRL-TR-67-16, DDC Document AD-672 958) (Project 7719, Task 771901) (CFSTI). This report documents the progress in developing and validating a prediction device for use in aiding decisions to return to active duty or discharge Air Force prisoners sent to the Retraining Group. First, there is an extensive review of the methodology and results of efforts to predict delinquency, recidivism, and military unsuitability. Then, two multiple regression analyses made on a sample of 1,303 former retrainees are reported. Each of the analyses yielded encouraging results in an initial cross-validation on 138 more recent retrainee cases for which actual criterion data were available. The cross-validation procedure was limited to making predictions on only 71 cases where the value of the multiple regression predicted score was sufficiently high or low to assure satisfactory accuracy. The best of the two regression equations, a 13-predictor system, was 77.4 per cent accurate in predicting successful return to duty and 72.5 per cent accurate in predicting unsuccessful return to duty. Details for applications of such a system, once adequately validated, to the operational decision-making process of the Retraining Group are given.

- 413 Dieterly, D.L. Retention of officers by source of commission. November 1967. (PRL-TR-67-17, DDC Document AD-674 590) (Project 7719, Task 771904) (CFSTI). Retention and loss information was extracted from the Project M data bank on all male line officers who entered the Air Force during the period January 1955 through December 1965. These data, presented in tabular form, give for each source of commission the input year and the loss during each succeeding year of persons of that input year group. Loss data through December 1966 are included. For the purposes of this study, the frequencies and percentages are presented as an historical statement of the retention and loss patterns for various commissioning sources, without differentiation on the basis of such variables as rating or reason for loss.

- 414 Quinn, J.L. The relation between effectiveness ratings and selected characteristics of the rating dyads. November 1967. (PRL-TR-67-18, DDC Document AD-683 726) (CFSTI). Because Officer Effectiveness Reports (OERs) are the principal basis for many personnel actions, especially selections for promotion and assignment, continuing effort is being expended to improve the accuracy of the ratings. Since empirical studies have found that the degree of similarity in characteristics between individuals influences their attraction to and interaction with one another, this study was initiated to determine if the relationships between the superior and subordinate in selected background and non-performance characteristics might influence the ratings of performance; i.e., is the rating score a function of the degree of similarity in characteristics between the rater and ratee?

Using data from both the OER and UOR files, variables were generated to describe the relationships between the rater/ratee pairs or dyads ( $N = 31,518$ ) in fourteen characteristics: age, race, religious preference, marital status, current military grade, professional career status, source of commission, aeronautical rating, professional military schooling, educational level, major academic field, primary and duty career specialties, and mean score of all previous ratings. Difference-between-means and variances analysis was employed to investigate the various relationships. Although higher ratings were reflected when the raters and ratees were of the same rather than different race or marital status, lower ratings were found when the rating dyads were similar vis-a-vis dissimilar in many other characteristics. Generally, however, relatively little bias in effectiveness ratings of Air Force captains could be attributed to the intradyadic relationships in the background and non-performance characteristics investigated. Rather, the characteristics of the ratee himself appear more important in influencing ratings than do the relationships between the dyad members in those characteristics.

- 415 Morsh, J.E., Nall, R.W., & Kudrick, H.M. Occupational survey of the preventive medicine career ladder 907X0. February 1968. (PRL-TR-68-1, Vol I, II, III) (Project 7734, Task 773401). A job inventory covering four specialties in the Preventive Medicine Career Ladder, and consisting of 275 tasks grouped under 16 duty categories, was administered to 381 airmen in 14 major air commands. Incumbents of all skill levels completed a background information section and rated on a 7-point scale relative time spent on tasks. The airmen also indicated on a 7-point scale amount of work experience on each task compared with other tasks performed. Job descriptions are presented for 32 groups selected according to background information variables. Included are 8 specialty groups, 10 groups with differing lengths of military service, 6 groups with differing job interests, 2 groups differing in directed duty assignment, 2 groups defined according to assignment inside or outside CONUS, 2 groups having had specific technical courses and 2 groups without these courses. Job descriptions are also presented for the Preventive Medicine Career Ladder total sample and for 17 significant job types identified by the automated job clustering program.

A group overlap matrix shows the similarity of groups in terms of time spent on tasks. Summary tables indicate the percentage of members in each group who perform each task. Group difference descriptions are given for selected groups. Distributions of background variables for the total sample and for the 32 specialty groups are also shown.

- 416 English, Jacqueline & Morsh, J.E. Occupational survey of the accounting and finance career field 671X1, 671X3, 67170, 67290. April 1968. (PRL-TR-68-2, Vol I, II, III) (Project 7734, Task 773401). A job inventory covering six specialties in the Accounting and Finance Career Field, and consisting of 468 tasks grouped under 14 duty categories was administered to 1543 airmen in 18 major air commands. Incumbents of all skill levels completed a background information section and rated on a 7-point scale, the relative time spent on tasks. The airmen also indicated on a 7-point scale how they learned to do the tasks performed, whether from school training or work experience. Job descriptions are presented for 21 groups selected according to background information variables. Included are six specialty groups and 15 groups with differing lengths of military service. Duty and task descriptions are presented for the Accounting and Finance total sample and for 60 significant job types identified by the automated job clustering program.

Group overlap matrices show the similarity of groups in terms of time spent on tasks. Summary tables indicate the percentage of members in each group who perform each task. Group difference descriptions are given for selected groups. Distributions of background variables for the total sample and for the six specialty groups are also shown. A table indicating how tasks were learned is reported for the six specialty groups. In Appendix 1 responses to items in the background information are presented for every case in the survey. The inventory of duties and tasks used in the survey is included in Appendix 2.

- 417 Gragg, D.B. Occupational survey of the navigator-observer utilization field 15XV. May 1968. (PRL-TR-68-3, Vol I-V, DDC Document AD-671 106) (Project 7734, Task 773401). A job inventory covering the six specialties, plus shredouts, of the entire Navigator-Observer Utilization Field, and consisting of 460 tasks grouped under 12 duty categories, was administered to the analysis sample of 1,996 officers in 19 major air commands. Incumbents of six grades, colonel to second lieutenant, completed a background information section and rated, on a 9-point scale, the relative time spent on tasks. The inventory of duties and tasks used in the survey is included at the end of Volume I.

Job descriptions are presented for 22 special groups selected on the basis of DAFSC and grade. Duty and task descriptions are also presented for 100 job type groups comprising 84 job types, 5 major clusters, 10 subclusters, and the total sample. All materials pertaining to the special groups are included in Volume I; printout materials on the job type groups are presented in Volumes II-V.

Group overlap matrices indicate the similarity of jobs in terms of percentage of overlap in time spent on tasks. Summary tables indicate the percentage of members in each group who perform each task. Group difference descriptions are given for selected pairs of job types. Distributions of background variables are shown for the 22 special and the 100 job type groups. In the KPATH Sequence Background Information printout, responses to items are listed for every case in the analysis sample.



- 418 Morsh, J.E., Atkins, L.W., & Boyce, S.B. Occupational survey of the dental laboratory career ladder 982X0. June 1968. (PRL-TR-68-4). (Project 7734, Task 773401). A job inventory covering four specialties in the Dental Laboratory Career Ladder, and consisting of 247 tasks grouped under 14 duty categories, was administered to 494 airmen in 16 major air commands. Incumbents of all skill levels completed a background information section and rated, on a 7-point scale, relative time spent on tasks. The airmen also indicated, on a 7-point scale, amount of work experience on each task compared with other tasks performed. Job descriptions are presented for 15 groups selected according to background information variables. Included are 8 specialty groups, 10 groups with differing lengths of military service, 2 groups differing in Directed Duty Assignment, 3 groups differing in job interests, 2 groups differing in reenlistment plans, 2 groups differing in job utilization and training, and 2 groups defined according to assignment inside or outside CONUS. Job descriptions are also presented for the Dental Laboratory Career Ladder total sample and for 15 significant job types identified by the automated job clustering program.

A group overlap matrix shows the similarity of groups in terms of time spent on tasks. Summary tables indicate the percentages of members in each group who perform each task. Group difference descriptions are given for selected groups. Distributions of background variables for the total sample and for the 29 specialty groups are also shown.

- 419 Drysdale, T. Improvement of the procurement, utilization, and retention of high quality scientific and technical officers. June 1968. (PRL-TR-68-5, DDC Document AD-677 196) (Contract AF 41(609)-3082, Data Dynamics, Inc.) (CFSTI). This study recommends changes in policies and actions which will improve Air Force procurement, utilization, and retention of high quality scientific and technical officers. Analyses of studies produced over the past ten years on this subject, and of discussions held with persons responsible for and knowledgeable in this field reveal key issues in which Air Force personnel conditions are seen as liabilities. The issues express values held to be most important to scientific/technical personnel which are believed to be least available in Air Force service. The key issues are: promotion on merit; consistent, intelligent personnel policies; voice in assignments; competent supervisors; fairly rapid advancement; recognition for accomplishment; good salary; and a military science as the scientific discipline of the military profession. Based on recent changes in technology and military posture, and weighed against the final criterion of Air Force mission accomplishment, the study develops five recommendations, together with initial implementing actions, which can transform the cited liabilities into assets. These are: distinction between R&D SCIENTIST and R&D MANAGER; development of a scientific grade/military rank composite for status and pay; establishment of a three-element, merit-based entry/promotion system; development of a three-element, feedback assignment system; and establishment of a military scientist career field.

- 420 Sturiale, Glory. Stereotyped patterns in Air Force officer performance factor ratings. June 1968. (PRL-TR-68-6, DDC Document AD-687 104) (Project 7719, Task 771904) (CFSTI). The purpose of this study was to determine if a rating rationale external to actual observations of performance could explain in part Officer Effectiveness Report factor ratings for field and company grade officers. Data were obtained from the Officer Effectiveness Reports Data Summary from 1961 through 1966. Rank-order correlations revealed highly stable rating patterns across time within each officer grade. With increasing distance between grades, the factor rating patterns showed increasingly smaller relationships. The highly predictable rating patterns for each officer grade across time provide evidence that a bias exists, and the trend in the decreasing size of the relationships between grades indicates that apparently this bias is related to grade. The hypothesized nonperformance bases of ratings may be useful for consideration in any future selection of rating factors designed to have minimum rating bias and provide maximum information of officer performance.

On the basis of the results obtained from this and other studies, the suggested hypothesis of a rating rationale based on importance of factors to grade is given some support. This interpretation of the data was related to the question of identifying performance standards for each officer grade and its implications for personnel management and the final criterion of identifying future Air Force leaders.

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- 421 Mullins, C.J., Massey, Iris H., & Riederich, L.D. Reasons for Air Force enlistment. July 1968. (AFHRL-TR-68-101, DDC Document AD-678 527) (Project 7719, Task 771906) (CFSTI). The Air Force Questionnaire was administered to four groups of basic airmen under different testing conditions to determine whether or not a questionnaire under consideration would elicit frank and honest responses. In so far as can be determined, the enlistees are giving their real reasons for enlisting in the Air Force. Analysis of responses shows educational opportunities to be the most popular reason for joining the Air Force.
- 422 Lancaster, W.A. & Morsh, J.E. Occupational survey of the jet engine mechanic career field 432X0. July 1968. (AFHRL-TR-68-102, Vol I, II, III) (Project 7734, Task 773401). A job inventory covering four specialties in the Jet Engine Mechanic Career Ladder, and consisting of 354 tasks grouped under 16 duty categories was administered to 1691 airmen in 15 major air commands. Incumbents of all skill levels completed a background information section and rated on a 7-point scale, the relative time spent on tasks. The airmen also indicated on a 7-point scale training required to do the tasks performed. Job descriptions are presented for 14 groups selected according to background information variables. Included are four specialty groups, and 10 groups with differing lengths of military service. Duty and task descriptions are presented for the Jet Engine Mechanic Career Ladder total sample, for nine job type clusters, and for 32 significant job types identified by the automated job clustering program.
- A group overlap matrix shows the similarity of groups in terms of time spent on tasks. Summary tables indicate the percentage of members in each group who perform each task. Group difference descriptions are given for selected groups. Distributions of background variables for the total sample, for the four specialty groups, and for nine job clusters are also shown. A table indicating how much training is required to perform a task is reported. Responses to items in the background information section are presented for every case in the survey. The inventory of duties and tasks used in the survey is included at the end of this report.
- 423 Miller, R.E. Predicting first year achievement of Air Force academy cadets, class of 1968. July 1968. (AFHRL-TR-68-103, DDC Document AD-679 988) (Project 7717, Task 771706) (CFSTI). Candidates for admission to the Air Force Academy are required to demonstrate their qualifications on a battery of selection tests. Successful candidates, upon admission to the Academy, are administered a battery of experimental tests as part of a program for the development of officer selection and classification instruments. The experimental tests are not used in making decisions affecting cadets, but both the selection and experimental batteries are validated against criteria which become available at the end of the fourth class (freshman) year. The criteria used for the validation study in the class of 1968 were the Academic Standard Score, Military Rating, Extracurricular Activities Standard Score, Composite Standard Score, and Early Motivational Elimination. Selection tests common to the classes of 1967 and 1968 tended on the whole to be slightly less valid in the class of 1968. However, the nonacademic selection tests were somewhat more valid in the class of 1968 as predictors of the Military Rating. All criteria were validly predicted by one or more of the experimental tests, but no set of experimental tests was found which contributed uniquely and validly to prediction of the Academic Standard Score or Extracurricular Activities Standard Score in the context of the selection tests. The highest multiple correlations with these criteria were .60 and .41, respectively. Sets of experimental tests were found which contributed uniquely and validly to prediction of the Military Rating and Early Motivational Elimination in the context of the selection tests. The highest multiple correlations with these criteria were .54 and .25, respectively. The Composite Standard Score, because of its high correlation with the Academic Standard Score, was not used in any multiple regression analysis. The best predictor of this criterion was the Academic Composite, composed of selection tests. Its validity was .51.
- 424 Miller, R.E. Development of officer selection and classification tests 1968. July 1968. (AFHRL-TR-68-104, DDC Document AD-679 989) (Project 7717, Task 771706) (CFSTI). In accordance with the normal two-year replacement cycle, new forms of the Air Force Officer Qualifying Test (AFOQT) and the AFROTC Pre-Enrollment Test (PET) were constructed for

implementation in Fiscal Year 1968. Both tests are designated by their fiscal year of implementation. AFOQT-68 closely resembles the previous form in type of content, organization, and norming strategy. It yields Pilot, Navigator-Technical, Officer Quality, Verbal, and Quantitative composite scores. Standardization was accomplished with reference to the Project TALENT battery in a way which permits relating AFOQT scores to performance of Air Force Academy candidates and 12th grade males. A new feature of AFOQT-68 is the provision of separate norms for AFROTC and other use. These norms take into account the effects of differences in level of formal education at the time of testing in various commissioning programs. Differences in educational level are also provided for in the norms of PET-68. To facilitate test administration, this test is considerably shorter than the previous form but otherwise resembles it. PET-68 yields a total score based on verbal and quantitative items. It is intended as a screening device for AFROTC candidates.

- 425 Lancaster, W.A. & Morsh, J.E. Occupational survey of the outside wire and antenna maintenance career field 361X0. August 1968. (AFHRL-TR-68-105, Vol I, II) (Project 7734, Task 773401). A job inventory covering four specialties in the Outside Wire and Antenna Installation and Maintenance Career Ladder, and consisting of 367 tasks grouped under 15 duty categories, was administered to 638 airmen in 8 major air commands. Incumbents of all skill levels completed a background information section and rated on a 7-point scale, the relative time spent on tasks. The airmen also indicated on a 7-point scale how important they considered the tasks performed, whether extremely important or extremely unimportant. Job descriptions are presented for 20 groups selected according to background information variables. Included are 4 specialty groups and 5 groups with differing lengths of military service. Duty and task descriptions are presented for the Outside Wire and Antenna Installation and Maintenance Ladder total sample, for 3 job type clusters, and for 17 significant job types identified by the automated job clustering program.

A group overlap matrix shows the similarity of groups in terms of time spent on tasks. Summary tables indicate the percentage of members in each group who perform each task. Group difference descriptions are given for selected groups. Distribution of background variables for the total sample, for the four specialty groups, and for 20 other groups reported is also shown. In Appendix 1 responses to items in the background information section are presented for every case in the survey. The inventory of duties and tasks used in the survey is included in Appendix 2.

- 426 Valentine, L.D., Jr. Relationship between Airman Qualifying Examination and Armed Forces Qualifying Test norms. July 1968. (AFHRL-TR-68-106, DDC Document AD-678 528) (Project 7717, Task 771705) (CFSTI). Relationships between Armed Forces Qualifying Test (AFQT) norms and Airman Qualifying Examination (AQE) norms were examined. While the norms are not in perfect agreement, the data suggest that they do not vary from each other to any sizable extent. Estimates (through Project TALENT data) of AFQT performance of 15-year-olds, 18-year-olds, and 12th graders were examined, and implications for military test norms were discussed.

- 427 Gregg, G. The effect of maturation and educational experience on Air Force Officer Qualifying Test scores. July 1968. (AFHRL-TR-68-107, DDC Document AD-687 089) (Project 7717, Task 771706) (CFSTI). It is known that maturation and education have an elevating effect on AFOQT scores. Since the AFOQT is administered at different educational levels for the several commissioning programs, differences which are largely spurious exist between the programs with respect to their score distributions. To evaluate the extent of differences produced by maturation and education, the AFOQT was administered experimentally to 415 AFROTC cadets in 32 institutions near the end of their senior year. Scores were compared with those obtained for the same group when they were tested as freshmen or sophomores for selection by the AFROTC program. For the experimental group as a whole, the Officer Quality score showed an increase of approximately 30 percentile points over the national mean for AFROTC applicants. The increase was greatest for cadets in rated categories (Category IP and IN) and in the scientific-technical category (Category II). Because of statistical artifacts, the increase was greater for those whose initial scores were low than for those whose initial scores were high. The increase in Pilot scores for the total group was about 20 percentile points, with the greatest increase (30 to 50 percentile points) occurring in the categories which received light

- plane training as part of the AFROTC curriculum. The increase in Navigator/Technical scores amounted to about 6 points for the total groups, but it approached 30 points for Category II cadets whose initial scores were below the 75th percentile. Category II cadets had initial scores about 30 points higher than cadets in nonscientific programs (Category III), and this difference persisted in the final testing. Data supported the additional finding that the known stable rank-ordering of institutions with respect to AFOQT scores of freshmen and sophomores applies also to AFOQT scores of seniors. The data also permitted determination of test-retest reliabilities and inter-correlations of AFOQT scores.
- 428 Wiley, L.N. & Cagwin, L.P. Comparing prediction of job performance ratings from trait ratings for aircraft mechanics and administrative airmen. October 1968. (AFHRL-TR-68-108) (Project 7734, Task 773404) (CFSTI). Supervisors in all commands rated aircraft mechanics on overall job performance and on 65 work-related traits. Of 1,290 rates, there were 852 who were rated by each of two supervisors, providing samples of 83 in DAFSC 43131, 418 in DAFSC 43151, 274 in DAFSC 43171, and 77 in DAFSC 43190. Trait predictions of overall performance yielded  $R^2$ 's ranging from .78 to .94, and cross-validation  $R^2$ 's from .33 to .86. Interpretations involved comparisons with previous findings obtained from ratings on administrative airmen. The analyses added confirmation in a different career ladder of most of the administrative ladder findings and suggested that there are some areas where the interpretations cannot be generalized from one work situation to another. It was concluded that any supervisor should be able to make this type of rating if given opportunity to observe the man. Particular attention should be given to the opportunity of supervisors to observe men.
- 429 Mayo, C.C. Survey of twenty-eight Air Force career ladders with nineteen job inventories. July 1968. (AFHRL-TR-68-109, DDC Document AD-687 091) (Project 7734, Task 773401; Contract AF 41(609)-3049, Lifson, Wilson, Ferguson, & Winick, Inc.). (CFSTI). Nineteen job inventories were constructed for survey of 28 Air Force career ladders. Background variables designed to discriminate among subjects were included in each inventory. A review of the contributions of technical advisers to inventory construction showed that airmen at the superintendent and technician levels provided the best job information. Problems arising in inventory construction are discussed and compared with problems encountered in previous research. Write-in information from administrative surveys was reviewed, and significant contributions were added to inventory content. Inventory responses were keypunched and verified in preparation for computation of group job descriptions.
- 430 Vitola, B.M. & Alley, W.E. Development and standardization of Air Force composites for the Armed Services Vocational Aptitude Battery. September 1968. (AFHRL-TR-68-110, DDC Document AD-688 222) (Project 7717, Task 771704) (CFSTI). This report describes the development and standardization of Air Force composites for the Armed Services Vocational Aptitude Battery (ASVAB). Characteristics of ASVAB items, subtests, and descriptive data are presented, as well as intercorrelations among the Airman Qualifying Examination (AQE), Project TALENT tests, and ASVAB variables. Correlation of the ASVAB composites with those of AQE-66 and Project TALENT indicates a high degree of relationship. Similarly, comparison of means and standard deviations derived from the norming samples of AQE-66 and the ASVAB indicates little difference between the samples. Finally, application of the Kuder-Richardson Formula 21 results in high reliability coefficients for the ASVAB composites: General AI .86, Administrative AI .91, Mechanical AI .84, and Electronics AI .91. Because of the high relationships between the aptitude composites of the ASVAB and the AQE, the AQE distributional data currently in use in selective recruiting programs and in the high school testing program are considered to be valid and generalizable to Air Force aptitude indexes derived from the ASVAB.
- 431 Mullins, C.J., Keeth, J.B., & Riederich, L.D. Selection of foreign students for training in the United States Air Force. November 1968. (AFHRL-TR-68-111, DDC Document AD-688 725) (Project 7719, Task 771906) (CFSTI). A group of tests has been used to predict success in pilot and technical training for groups of foreign nationals trained in the United States. In addition to previous flying experience two types of tests were tried: paper-and-pencil and performance tests, hopefully of

low cultural loading. For those going into pilot training without previous pilot experience, one performance test, rudder control, gave the highest prediction, with one of the paper-and-pencil tests adding significantly. For technical training, five paper-and-pencil tests showed low but significant prediction.

It is noted that three of the paper-and-pencil tests, used alone, are significantly valid for pilot training and can make considerable improvement in pilot trainee selection procedures.

- 432 Valentine, L.D., Jr., Vitola, B.M., & Guinn, Nancy. Revision and standardization of the radio operator composite. October 1968. (AFHRL-TR-68-112, DDC Document AD-688 223) (Project 7717, Task 771705) (CFSTI). The Radio Operator Aptitude Index is used to select non-prior-service personnel for the Communications Operations (29) career field. This report describes a revised Radio Operator Composite which appears to predict success in technical school as well as the previous form. Scoring and processing procedures are explained in detail so that this technical report may also serve as a scoring manual for test administrators. The revised method of computation will result in a reduction of testing, scoring, and processing man-hours. Technical data relevant to the revision are presented in the appendix.
- 433 Sturiale, Glory. The officer effectiveness report as a performance measure: a research review. December 1968. (AFHRL-TR-68-113) (Project 7719, Task 771904) (CFSTI). This report reviews a decade of research concerned with the Air Force Officer Effectiveness Report. One major group of studies concerns the OER used as a performance measure for personnel management purposes. This group includes analyses of relationships between officer effectiveness ratings and such situational and demographic factors as AFSC, grade, command, and education. The second area of research includes studies designed to determine the relationships between certain variables and officer performance where the OER has been used as a criterion measure for this performance. These investigations are concerned for the most part with measurement and improvement of officer selection devices and training programs. An attempt was made to examine critically the results obtained and arrive at whatever empirical and interpretive generalizations such a diversity of data permits.
- 434 Tupes, E.C. & Dieterly, D.L. Adjusted OER scores with inflation effects removed. November 1968. (AFHRL-TR-68-114, DDC Document AD-688 537) (Project 7719, Task 771904) (CFSTI). A method was developed to remove the effects of inflation and form changes from numerically coded OER overall ratings. Application of the technique permits more accurate comparisons of officer effectiveness between groups and across time. Some such comparisons are illustrated using data obtained from the Project M file of officers on active duty at the end of 1967. The feasibility of the adjusted OER technique is demonstrated in these comparisons between various subgroups of the total officer population.
- 435 Vitola, B.M. Development and standardization of the Airman Classification Test-1968. September 1968. (AFHRL-TR-68-115, DDC Document AD-687 090) (Project 7717, Task 771705) (CFSTI). The Airman Classification Test is used by the United States Air Force for all airman classification programs except selective enlistment. It yields four aptitude indexes comparable to those of the Airman Qualifying Examination: Mechanical, Administrative, General, and Electronics; the ACT-68 is more similar to the AQE than the 1964 form. The ACT-68 may be scored by hand or by machine. Modification and simplification of the scoring system should result in increased ease of administration and economy when the test is scored in the field.
- 436 Dieterly, D.L. Simplified approach to a manpower management model. December 1968. (AFHRL-TR-68-116, DDC Document AD-688 538) (Project 7719, Task 771907) (CFSTI). A manpower management model was designed to reflect four factors of concern to personnel managers: procurement, training, reassignment, and retention. Within the framework of this model, seven basic indexes were developed to yield simple, reliable descriptive data by which a manpower structure can be assessed at given points in time. These indexes permit evaluation of the consequences of past policies and anticipation of needs for future policy change. By means of the simple ratio indexes, specific manpower problem areas can be identified, and force strength can be compared across seven dimensions (loss, retention, gain, flow, transfer, utilization, and stability) and at various levels within an organization.

- 437 Kaplan, Margorie N., Madden, H.L., & Tupes, E.C. Estimates of OER distributions by Air Force officers. December 1968. (AFHRL-TR-68-117) (Project 7719, Task 771904) (CFSTI). When officers in grades Second Lieutenant through Colonel were asked to estimate percentages of officers represented in each of the ten rating boxes of the overall evaluation on the Officer Effectiveness Report (OER), accuracy of estimation of actual OER distributions varied as a function of (a) the grade of the rater, (b) the grade being estimated, (c) interaction between rater's grade and the grade being estimated, and (d) other characteristics of the rater, particularly duty assignment. Although most officers appeared to be aware of inflation in OERs, the extent of this problem was not fully realized.
- 438 Tupes, E.C., Dieterly, D.L., Fortuna, A.L., & Madden, H.L. Development of a data base for an AFROTC management control system. December 1968. (AFHRL-TR-68-118, DDC Document AD-688 539) (Project 7719, Task 771908) (CFSTI). This report describes the origin and rationale of the concept of an AFROTC Management Control System, and the development of a data base upon which such a system must depend. A detailed list and descriptions of all variables in the data base are included. Some example distributions are included to illustrate the type and magnitude of differences existing between the various AFROTC detachments. It is concluded that substantial improvements in the cost-effectiveness of the AFROTC program are possible through the use of the AFROTC Management Control System but that the interrelationships between the various factors entering into such a system are so complex that the use of an electronic computer in the data analyses is a necessity.
- 439 Tupes, E.C. & Madden, H.L. Prediction of officer performance and retention from selected characteristics of the college attended. December 1968. (AFHRL-TR-68-119, DDC Document AD-688 540) (Project 7719, Task 771908) (CFSTI). This report describes analyses of relationships between military performance and retention rates of officers entering active duty from each of 172 AFROTC detachments during the period 1958-62 and characteristics of the colleges and universities at which the detachments are located. The analyses indicate that the differences between AFROTC detachments are primarily due to differences in the student bodies of the colleges and to a great extent are beyond the control of the Professors of Air Science or their staffs. It appears, then, that retention rates of AFROTC graduates can be increased by differential assignment of quotas to AFROTC detachments or by disestablishment of certain detachments. Implications of the study for the Officer Training School Recruiting and Selection systems are discussed.
- 440 Phalen, W.J. Occupational survey of the inventory management and materiel facilities career ladders 645X0/647X0. December 1968. (AFHRL-TR-68-120) (Project 7734, Task 773401). A job inventory covering eight specialties in the Inventory Management and Materiel Facilities Career Ladders, and consisting of 291 tasks grouped under 15 duty categories, was administered to 1790 airmen in 16 major air commands. Incumbents of all skill levels completed a background information section and rated on a 7-point scale relative time spent on tasks. The airmen also indicated on a 7-point scale how much training emphasis should be given to the tasks performed. Job descriptions are presented for 10 "special" groups selected according to background information variables. Included are four DAFSC groups and one total sample group for each career ladder. Duty and task descriptions are presented for the total Inventory Management and Materiel Facilities sample, for 10 major job-type clusters, for 7 job-type subclusters, and for 83 significant job types identified by the automated job clustering program.
- A group overlap matrix shows the similarity of groups in terms of time spent on tasks. Group summary tables indicate the percentage of members in each group who perform each task. Group difference descriptions are given for DAFSC and career ladder groups. Distributions of background variables for the total sample, the 10 major job-type clusters, and the 7 job-type subclusters are also shown. Also included are distributions of background variables for the 2 career ladders and 8 specialty groups. Responses to items in the background information section are presented for every case in the survey. The complete inventory of duties and tasks used in the survey is also included.
- 441 Mead, D.F. Occupational survey of the intelligence operations (204X0) and photo interpretation (206X0) career ladders. December 1968. (AFHRL-TR-68-121, Vol 1, II) (Project 7734, Task 773402). A job inventory covering the Intelligence Operations and Photo Interpretation Career Ladders, and consisting of 356 tasks grouped under 15 duty categories, was administered to 1,627

airmen in 15 major air commands. Incumbents of all skill levels completed a background information section, indicated each task performed in their present job and rated on a 7-point scale the relative time spent on those tasks performed. The airmen also indicated on a 7-point scale the source of training for each task performed. Job descriptions are presented for 8 specialty groups, for the Intelligence Operations and Photo Interpretation Career Ladders total samples, the combined total sample, five major job clusters, and for 64 significant job types identified by the automated job clustering program.

Group overlap matrices show the similarity of groups in terms of time spent on tasks. Summary tables indicate the percentage of members in each group who perform each task. Group difference descriptions are given for selected groups. Distributions of background variables for the total samples, DAFSC groups, major clusters and job types are also shown. The inventory of duties and tasks used in the survey is included in the Appendix.

- 442 Morsh, J.E., Aitken-Cade, P.B., & Boyce, S.B. Occupational survey of the weapon control systems career ladder 322XX. December 1968. (AFHRL-TR-68-122, Vol I, II) (Project 7734, Task 773401). A job inventory covering four specialties and their shredouts in the Weapon Control Systems Career Ladder (AFSC 322X1), and consisting of 572 tasks under 16 duty categories, was administered to 1319 airmen in 10 major air commands. Incumbents of all skill levels completed a background information section and rated on a 7-point scale relative time spent on tasks. The airmen also indicated on a 7-point scale how they learned to do the tasks performed, whether from school training or work experience. Job descriptions were computed for 45 groups selected according to background variables; however, of these only the 19 AFSC job descriptions are presented in this report. Job descriptions are also presented for the Weapon Control Systems Career Ladder total sample, 5 job type clusters, and 33 significant job types identified by the automated job clustering program.

A group overlap matrix shows the similarity of groups in terms of time spent on tasks. Summary tables indicate the percentage of members in each group who perform each task. Group difference descriptions are given for selected pairs of specialties. Distributions of background variables for the total sample, job type clusters, job types, and for the DAFSC groups are also shown. An analysis of the ratings for the method of training is presented for the four DAFSC groups and three shredout groups.

- 443 McClure, G.E. Job-associated problems encountered by airmen in Southeast Asia as reported by returnees. December 1968. (AFHRL-TR-68-123) (Project 7734, Task 773401; Contract AF 41(609)-68-C-0034, Data Dynamics, Inc.) (CFSTI). This report documents a survey of United States Air Force personnel concerning their jobs in Vietnam and Thailand. The report describes the preparation of updated Air Force Job Inventories, selection of the study population, conduct of a mail survey, and personal interviews with commissioned officers and airmen. Primary purposes of the mail survey were to identify tasks in Southeast Asia jobs in which airmen experienced difficulty and to identify individuals for later personal interview.

Interviews were conducted to probe deeper into matters mentioned by respondents in the mail survey, to compare jobs in Southeast Asia with the same jobs elsewhere in the Air Force, to ascertain difficulties in reaching or maintaining proficiency, and to determine the extent to which the existing Air Force system prepares airmen for jobs in Vietnam and Thailand.

The study population was comprised of airmen in 40 different career specialties and a sampling of commissioned officers who supervised airmen in one or more of the same fields. Mail survey results included responses from 4,119 airmen and 689 commissioned officers. The personal interview sample consisted of 654 airmen and 127 commissioned officers.

Analysis of both mail and interview responses indicated that the job tasks in the 40 specialties in this study are essentially the same in Southeast Asia as they are elsewhere in the Air Force. Respondents reported a need for more training on only a relatively small number of tasks in each specialty. Most job-related difficulties were reported as being caused by factors other than a lack of proficiency of airmen.

- 444 Barlow, Esther (Ed.) Abstracts of personnel research reports: VIII. 1954-1968. December 1968. (AFHRL-TR-68-124) (CFSTI). This volume includes abstracts of the 444 technical reports issued by the Personnel Research Division and its antecedent organizations from January 1954 through December 1968. They cover studies in selection, classification, and utilization of Air Force personnel; systematizing information flow in support of personnel planning; methods of describing, evaluating, and structuring Air Force jobs; and development of procedures for improving the quality of Air Force personnel.



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